COMMERCIAL FISHERIES Review

VOL. 31, NO. 2

FEBRUARY 1969

COVER: Japanese fisherman holds typical wicker and grass basket containing a single set or skate of coiled longline gear. Number of hooks in basket varies from 20 to 50. See article p. 26.
(Photo: Branson)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

Managing Editor: Edward Edelsberg

Production Manager and Associate Editor: Jean Zalevsky

Associate Editor: Barbara Lundy

Production: Alma Greene (Senior Compositor) and Mary Andrews

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

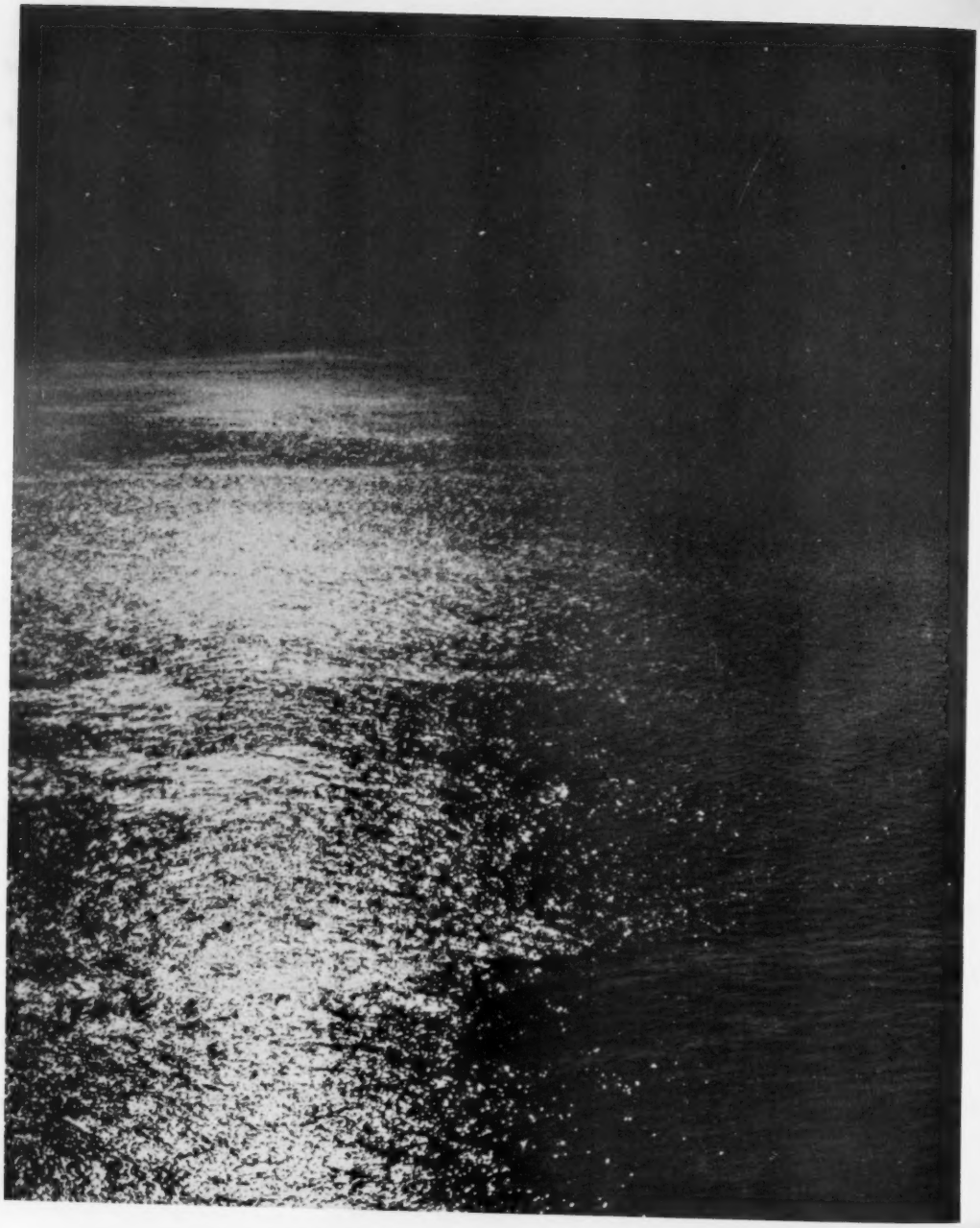
Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

Use of funds for printing this publication was approved by the Director, Bureau of the Budget, April 18, 1968.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Price 60 cents (single copy). Subscription Price: $7.00 a year; $2 additional for foreign mailing.

CONTENTS



BROAD U.S. EFFORT URGED TO UNDERSTAND, USE AND PRESERVE OCEANS

"We believe that a vigorous, systematic investment in the oceans will yield a tremendous return over the years ahead--a tangible return to the economy and an intangible return of priceless value, the quality of the environment in which we live."

The speaker was Dr. Julius A. Stratton, Chairman of the Commission on Marine Science, Engineering and Resources, at a press conference held Jan. 11, 1969, before public release of the Commission's final report to the President and Congress. Dr. Stratton is chairman of the Ford Foundation and former head of M.I.T.

After nearly 2 years of study, the 15-member Commission urged a large U.S. investment in ocean research to understand, use, and protect the oceans. The Commission members included experts from U.S. and State governments, universities, industry, and marine laboratories.

The Commission studied a vast range of marine problems--from preserving coastal shores and estuaries to "more effective use of the vast resources that lie within and below the sea." Its members consulted with more than 1,000 people: marine scientists, engineers, leaders of business and industry, academic community, and many marine specialists in U.S., State, and local governments.

The Commission recommended creation of a new U.S. agency for the oceans and the atmosphere: The National Oceanic and Atmospheric Agency (NOAA). Initially, NOAA would be composed of the U.S. Coast Guard, the Environmental Science Services Administration, the Bureau of Commercial Fisheries (plus the marine and anadromous fisheries functions of the Bureau of Sport Fisheries and Wildlife), the National Sea Grant Program, the U.S. Lake Survey, and the National Oceanographic Data Center.

The Commission did not urge a crash program--"but one geared realistically to the means of the Nation." The 1969 budgets for the agencies and programs that would be transferred immediately to NOAA--if President Nixon and the 91st Congress approve--total $773 million. The Commission projects for 1980 a $2 billion annual operating budget for NOAA.

BIRTH OF COMMISSION

Creation of the Commission was authorized by Public Law 89-454, enacted by Congress on June 17, 1966. President Johnson appointed the members on Jan. 9, 1967. The Act also set up the National Council on Marine Resources and Engineering Development.

The Council chairman is the Vice President. The Council is made up of the heads of major Federal departments and agencies with marine missions. It plans and coordinates the existing marine programs and advises the President. It surveys the state of marine affairs and shapes and strengthens Federal programs.

The Commission was not given operating responsibility. In its Report, the Commission recommended that the Council, scheduled to expire June 30, 1969, continue until NOAA is established.

The Act expressed the conviction that the U.S. ought to give serious attention to its marine environment--and to the seas' potential resources. It also showed, the Commission Report noted, U.S. determination to act in order to "stimulate marine exploration, science, technology, and financial investment on a vastly augmented scale."

The Commission was asked to study the U.S. stake in the "development, utilization, and preservation of our marine environment. . .to review all current and contemplated marine activities and to assess their adequacy to achieve the national goals set forth in the Act. . . ." And the Commission was asked "to formulate a comprehensive, long-term, national program for marine affairs designed to meet present and future national needs in the most effective possible manner. . .and to recommend a plan of government organization best adapted to the support of the program and to indicate the expected costs."

To carry out its mission, the Commission divided itself into 7 panels: basic science; marine engineering & technology; marine resources; environmental monitoring and the management of the coastal zone; industry and private investment; international issues; and education, manpower, and training.

U.S. AND THE SEA

The Report states: "How fully and wisely the United States uses the sea in the decades ahead will affect profoundly its security, its economy, its ability to meet increasing demands for foods and raw materials, its position and influence in the world community, the quality of the environment in which its people live."

By 2000, the U.S. will have 350 million people and will rely more on food from the sea. New jobs will be needed and the expanded ocean industries will offer opportunity for economic growth. Today's industrial operations in the sea show the potential for greater economic operations: offshore petroleum, gas, and sulphur recovery; mining of tin, diamonds, sand, gravels, and shells from the seabed.

Along with economic development must go other considerations. The oceans are one part of the whole physical environment--and much more must be known about it. "It is critical to protect man from the vicissitudes of the environment and the environment, in turn, from the works of man." Today, the chance of quick economic gain makes man ignore the environment.

If the sea and shoreline are protected, they can provide recreational opportunities for the growing U.S. population. But, the Report warns, "the pollution problem pervades all aspects of our expanding technological society."

"The oceans and marine-related activities must be viewed in the context of the total land-air-sea environment. In many ways, the oceans are the dominant factors in this total environment." Man's intervention in any one element affects the others. "The Nation's stake in the oceans is therefore an important part of its stake in the very future of man's world."

A PLAN FOR NATIONAL ACTION

A solid base of science and technology is "the common denominator" to accomplishment in the marine world, the Report emphasizes. It makes clear what is needed to advance U.S. technical capability in order to realize fully the sea's potential:

• Marine Science: It is vital to support basic marine research if the U.S. is to "understand the global oceans, to predict the behavior of the marine environment, to exploit the sea's resources, and to assure the national security."

Today, the U.S. "is poorly organized to marshal the arrays of multiple ships, buoys, submersibles, special platforms, and aircraft, as well as the complex undersea facilities required for important oceanic investigations and experiments of a basic character."

The Commission proposes that several leading institutions in ocean research be designated by the U.S. "University-National Laboratories" and be "equipped to undertake major marine science tasks of a global or regional nature." Their establishment should not prevent other marine science research in other schools from getting help.

• Marine Technology: The Commission urges that NOAA begin a program to encourage development of basic marine technology and engineering to expand undersea operations and to lower their costs. It proposes that 2 U.S. goals be pursued at same time:

--Development of technology to carry out production work "for sustained periods" down to 2,000 feet.

--Development of technical capability to go down for useful purposes to 20,000 feet. (This takes in about 98% of world's ocean floor.)

• Scientific & Technical Information: A successful national ocean effort needs improved communications throughout the marine community.

• Manpower for a Marine Effort: NOAA should help to "develop and maintain manpower inventories, statistics, trends, and projections."

• Support Capability for Marine Operations: Marine operations depend on services provided primarily by the Federal Government. These services include: "mapping and charting, aids to navigation, maintenance of waterways, salvage, safety, law enforcement, and certification of some types of personnel and equipment." Some of these are satisfactory, others need upgrading, and virtually

all "will be inadequate to satisfy the demands of an expanded national effort."

• Exploring, Monitoring, Predicting, & Modifying Environment:

The Commission says the U.S. "must have a comprehensive system for monitoring and predicting the state of the oceans and the atmosphere. The U.S. has the beginnings of such a system today. . . ." Because increasing technological capabilities give man the power "to intervene in natural environmental processes for beneficial ends," the Commission believes that the problems of modifying the environment cannot be separated from those of monitoring and predicting the environment. It recommends "a concerted effort by NOAA to explore the feasibility and consequences of environmental modification."

• Exploring the Deep Sea: "Present instruments to observe and measure in the depths are entirely inadequate. Except for occasional samples of the bottom and the living organisms of the abyss, little is known about the deep ocean." Instrumentation must be improved drastically, especially that for surveying marine resources accurately.

But instruments alone are not enough. Man must be able to go to the depths for extended periods. The U.S. should start "to develop deep submersibles with ocean transit capabilities for use as research and exploration platforms at depths to 20,000 feet under the sea, and to study the feasibility of manned deep ocean stations."

• Environmental Modification: The U.S. must develop the skills and equipment to assess "the global consequences of man's activities, such as the burning of fossil fuels, the use of pesticides and insecticides and the effects of particulate and gaseous pollutants."

A PLAN FOR COASTAL ZONE

• Managing the Coastal Zone: 30 States border sea coasts and the Great Lakes. They are principally responsible for determining whether actions "on or near our shores are beneficial or damaging." Effective State action often is very difficult because of conflicting and overlapping U.S., State, and local laws concerning coastal-zone activities. There is little coordination.

The Commission recommends that primary responsibility for managing the coastal zone remain with the States--but that Federal legislation be enacted "to encourage and support the creation of State Coastal Zone Authorities to carry out specified national objectives with regard to the zone. The Authorities should have clear powers to plan and regulate land and water uses and to acquire and develop land in the coastal zone." The legislation should give NOAA primary responsibility for working with the States.

• Science & Technology in Coastal Zone: More scientific knowledge is needed about natural coastal-zone processes on which to base important management decisions.

The Commission recommends "designation and support of university-affiliated Coastal

Zone Laboratories to work on regional and local problems." These labs will perform services like those of agricultural research stations and extension services. They should be developed and supported by NOAA.

In addition to the labs, representative coastal and estuarine sites should be set up "as natural preserves." There, necessary studies should be conducted "to establish a proper base from which the effects of man's activities can be determined and ultimately predicted."

• Attacking Coastal Zone Pollution Problems: Coastal waters have been polluted by wastes dumped into the rivers, the filling of marshlands, and the spreading of spoil from dredging. Research into these pollution problems must be speeded, and methods devised to handle waste collection and treatment. U.S. labs, universities, and industry must concentrate on this purpose. The work should begin "far upstream."

• Great Lakes Restoration: To reverse the deterioration of the Great Lakes under man's assault for a century is an "urgent national need." Restoration may be possible. The Commission proposes a "National Project" to speed the necessary scientific research and technological development.

• Interim Policies: The plans for the estuaries and coastal zones will take time. Meanwhile, existing U.S. and State laws on water quality must be enforced strictly. States must move very slowly before approving operations that may alter the coastal zone until more information about the effects of these operations are known--and until State plans can be developed.

Developing Resources of Sea

There are many resources beyond the shoreline already contributing much to the U.S. economy. There is need for an "institutional framework and the scientific and technological foundation" to assure that the U.S. can get these resources when she needs them.

Commercial exploitation of these resources is the domain of profit-oriented industry. The U.S. plan should make it possible for industry to operate effectively with U.S. help when it is needed.

Drugs from the Sea

Both marine plants and animals have active substances that are potential drug sources to treat humans. The Commission recommends establishment of a new Institute of Marine Medicine and Pharmacology in the Department of Health, Education, and Welfare to evaluate these substances. The Institute should establish the basic information the pharmaceutical industry needs.

World fisheries remain the sea's largest economic harvest--despite the large amount of oil taken and the growing production of other marine minerals. The annual value of the world catch of fish and shellfish, estimated at $10 billion in 1968, is nearly one and a

third that of all other resources. During the past decades, it has increased over 6% a year.

While world fishing has increased, the relative position of the U.S. has dropped. During the past 30 years, the U.S. catch has remained "almost constant." Although she accounts for only 4% of world catch, the U.S. consumes about 12% of the total and is the world's largest market.

Foreign nations catch more fish on traditional U.S. fishing grounds than U.S. fishermen. The latter harvest less than 10% of the useful and available species adjacent to the coasts. Except for such fisheries as tuna and shrimp, the U.S. fleet is technically outmoded. U.S. fishermen are unemployed more and earn lower incomes than other workers of comparable age and skill.

While there is "no compelling reason" for U.S. fishermen to catch all fish consumed here, major parts of the U.S. fishing industry "can be restored to a competitive, profitable position with consequent benefit to the economy." Modern U.S. vessels on the world's fishing grounds would strengthen U.S. ability to negotiate a "productive and equitable system to regulate international fisheries."

The Commission proposes a "multiple attack" on fishery problems "with scientific research to improve understanding of the resources, exploration to determine quantities and locations, technology to develop efficient methods of harvesting and processing, and an improved framework (principles, procedures, and institutions)." These should enable U.S. fisheries to compete without subsidy or protection.

Framework for Fishery Development

To rehabilitate the fisheries, the U.S. "must eliminate the overlapping, conflicting, restrictive Federal, State and local laws which have hampered even those fisheries with sufficient capital and technological skill to be truly competitive." Protectionism and parochial state laws "have impeded the development and use of modern fishing technology. Federal support programs have not served their purpose."

Fishery laws and regulations should be studied and restructured. A new framework should be created based on U.S. objectives for fishery development and the best information. The interests of sport fishermen should be considered.

The Commission proposes that State responsibility for managing fish stocks in coastal zone waters continue--but that NOAA take jurisdiction over endangered fisheries if the States fail to take conservation measures. To rehabilitate the U.S. fisheries, the requirement that fishermen buy only U.S.-produced vessels and gear should be ended. Fishermen should be allowed to buy better gear, boats, and at lower prices anywhere.

Research, Technology, & Survey Programs

We have inadequate knowledge of the availability and distribution of marine species; optimum annual harvest consistent with

conserving valuable species; life cycle and ecological relationships among species; how estuarine-dependent species are affected by man's changes. Yet about 70 of such species make up about two-thirds of U.S. catch.

The Commission recommends that NOAA begin to get this information. It should seek, particularly, underutilized fisheries off U.S. "Once located and sustainable yield determined, the fish should be caught with maximum efficiency, carried to market in the best condition, and ultimately retailed or processed." New technology is needed to improve these operations. To increase fish consumption, "new fish stocks, new processes, and new markets must be created. The Commission recommends that NOAA develop its technology program to accomplish these ends."

Aquacultural Research and Development

Aquatic culture of some species can contribute much to the economy and to the war on hunger. The harvestable surplus of natural stocks is limited. But harvests of cultured species are limited only by the acreage used, and by economic competition with other marine stocks.

Sea plants have industrial value, "but many promising commercial uses are still limited by the availability of seaweed supplies." Evidence shows some useful seaweeds can be cultured. "Although research is rapidly demonstrating the feasibility of aquaculture, full-scale commercial application is limited by legal, organizational, political, and technical constraints." As these are removed, aquaculture "should become a powerful new global resource."

The Commission recommends that NOAA be responsible for advancing aquaculture.

HOW TO HELP INDUSTRY

The Commission recommends these approaches to aid the U.S. fishing industry:

- "The U.S. should continue its own research programs aimed at improving stock and yield estimates, cooperate with other nations in programs for this purpose, and explore new techniques for preliminary assessment of stock size and potential yield where new fisheries are contemplated."

- Fisheries management should have as a major objective "production of the largest net economic return consistent with the biological capabilities of the exploited stocks."

- Voluntary steps should be taken--and, if necessary, governmental action--to reduce excess fishing effort. This would make it possible for fishermen "to improve their net economic return and thereby to rehabilitate the harvesting segment of the U.S. fishing industry."

- "The goal of domestic fisheries management must be the development of a technically advanced and economically efficient fishing fleet with the minimum number of units required to take the catch over a prolonged period of time. This goal must be achieved in fisheries which are now heavily

over-capitalized without seriously dislocating those fishermen who entered the industry in good faith."

The international law of fisheries prevents the U.S. from acting alone to "maximize the net economic returns" of U.S. vessels fishing on international grounds. If the U.S. tried to limit its fleet in these fisheries, other nations could increase theirs--and so prevent the U.S. from raising its share per unit of effort.

Where U.S. fishermen alone are permitted to fish, U.S. or State action can control the amount of fishing. The action should meet local conditions.

Fishermen & Fishing

The Commission Report notes: "Fishing is an ancient business, and its practitioners often are less concerned with economic efficiency than with the simple fact of making a living from the sea. Fishermen may be perfectly aware that a half-dozen modern, efficient ships could harvest the permissible crop with high monetary return, but they still may prefer a system under which a number of fishing families can eke out what, to them, is an adequate living of the kind they prefer. Because such fishing communities form the constituencies of important elements in state legislatures, their desire to maintain the status quo has a strong influence on fishing legislation and on regulations of state agencies."

REHABILITATING THE INDUSTRY

The U.S. fishing record contrasts sharply with the record growth of world high-seas fisheries. During the past 30 years, U.S. landings have remained about the same, and the U.S. position among the world's fishing nations has fallen from second to sixth. U.S. vessels land about one-third of the fish eaten in the U.S.

There are a few bright spots on the record--most notably, the tuna and shrimp fisheries. And, overall, the U.S. catch is third or fourth in the world when measured in dollar value. But the U.S. fishing fleet is outmoded technically. It cannot carry out high-seas operations needed to maintain a world-leadership position--and it cannot attract "a stable and efficient labor supply."

Demand for Seafood Strong

This fishing industry decline has occurred despite the strong demand for fish and shellfish products. Per-capita human consumption has remained about the same during the past 30 years, but population growth has expanded the market. U.S. agriculture has reduced the cost of livestock feeds by using fish meal as an ingredient. So total U.S. per-capita consumption has increased sharply since 1950--but the increase has been met by imports, not by increased U.S. production.

The Commission says that the U.S. does not have to be completely self-sufficient in

fishery products any more than in other products. The total welfare of the fishing industry, including processing and marketing, "dictate the desirability" of buying marine products from the cheapest and best sources. The two healthiest fisheries, tuna and shrimp, are among the largest importers--yet have increased demand for U.S. production.

The Commission believes that important industry segments can be restored to "competitive, profitable operation." But it will be necessary to overcome obstacles to efficient operation even where U.S. technology and capital should have given the fleet a competitive advantage.

Federal & State Management Roles

There are too many restrictive and overlapping laws and regulations concerning U.S. fishing. The States have most jurisdiction over management and development; the lines between the States and U.S. are poorly defined. Too much protective legislation "militates against research, development, and innovation. Consequently, the fishing industry has been slow even to borrow useful techniques from other industries, much less to pursue a progressive program of its own."

The U.S. has "no explicit role" in managing fisheries within U.S. territorial waters. Because there is a "discouraging lack of coordination among State programs," the Commission concludes that U.S. leadership and, when necessary, regulatory power, "must be asserted."

The Commission recommends: "The National Oceanic and Atmospheric Agency [BCF in this operation] establish national priorities and policies for the development and utilization of migratory marine species for commercial and recreational purposes in cooperation with other Federal agencies, States, and interstate agencies."

Further, says the Commission: "NOAA (BCF) should encourage interstate cooperation for regulation and conservation, sponsor research on the impact of institutional barriers inhibiting the efficient development of our commercial fisheries, and encourage enactment of improved state laws relating to the regulation and conservation of such fisheries. The Federal Government also should reorient its fisheries research and survey activities in support of specific fisheries missions."

But even more is needed, the Commission states. It recommends that NOAA (BCF) "be given statutory authority to assume regulatory jurisdiction of endangered fisheries when it can be demonstrated that:

- "A particular stock of marine or anadromous fish migrates between the waters of one State and those of another, or between territorial waters and the contiguous zone or high seas; and

- "The catch enters into interstate or international commerce, and

- "Sound biological evidence demonstrates that the stock has been significantly reduced or endangered by act of man, and

• "The State or States within whose waters these conditions exist have not taken effective remedial action."

Vessel Subsidy Program

The U.S. fishing fleet is the world's second largest, but 60% of it is over 16 years old and 27% over 26 years. The tuna, shrimp, and Alaska king crab fleets are fairly modern, but fishing technology progress has made most of U.S. fleet obsolete.

The cost of building fishing vessels in some foreign shipyards is 40 to 50 percent lower than in U.S. shipyards. Yet U.S. laws prohibit fishermen from buying foreign-built vessels for use in domestic fisheries. To help correct this inequity, Congress passed in 1964 the United States Fishing Fleet Improvement Act (P.L. 88-498).

Under this program, the Interior Secretary can pay up to 50% of construction cost of new fishing vessel if vessel, the owner, and the fishery meet certain requirements.

The Commission recommends enactment of legislation "to remove the present legal restrictions on the use of foreign-built vessels by U.S. fishermen in the U.S. domestic fisheries."

Research and Technical Programs

NOAA (BCF) should concentrate its efforts where the greatest opportunities exist for successful economic expansion. These areas and species "might include Mid-Pacific tuna, demersal, and other fish and shellfish resources in the Gulf of Alaska, anchovy off the southern California coast, clupeids in the Gulf of Mexico, alewives (and their predators) in the Great Lakes, and Pacific hake."

The development of these high-potential fisheries can be aided by:

• "Surveys and exploratory fishing programs to establish the potential of latent stocks;

• "Basic biological studies to provide a basis for yield assessment;

• "Development of new harvesting techniques and strategies;

• "Development of more efficient methods for processing and handling fish products, including quality control and increasingly diversified product utilization."

The Commission recommends that NOAA (BCF) "analyze each major fishery and develop integrated programs designed to exploit those fisheries where opportunities for expansion exist."

Not enough is known about the stocks available off the U.S. and about the factors determining their yield, particularly for low-valued species. To develop new fisheries, it is necessary to determine the amount of the resources that fishermen can "reasonably expect to harvest profitably." The U.S. Government must support this expanded survey program because no single sector of the industry can afford it. The program also would obtain the basic information to manage the

resources rationally. "Only by delineating resource potentials can overfishing be detected before the damage is done and new fishing grounds be identified to relieve the pressures on the old," the Report states.

The Commission has endorsed a BCF proposal that gives priority to those species and areas where U.S. vessels might have strong competitive advantage. By adding 11 chartered vessels to its fleet, BCF would be able to map completely the groundfish and shellfish resources of the U.S. continental shelf--and complete preliminary work on pelagic and midwater fisheries--within 10 years.

The Commission recommends that NOAA (BCF):

- "Develop rapid means for stock assessment;
- "Conduct surveys and exploratory fishing programs to identify and establish the dimensions of latent fisheries off the U.S. coast;
- "Continue to support basic studies relating to fish habitats, population dynamics, and the effects of environmental conditions;
- "Give priority attention to development of improved statistical data and analytic techniques."

Technical Programs

The expense in U.S. fisheries can be reduced by improving conventional gear and using equipment developed abroad. The Commission recommends that NOAA (BCF) set up "an expanded program to develop fishing technology by improving the efficiency of conventional gear and developing new concepts of search, detection, harvesting, transporting, and processing."

Extension Services

The Commission recommends that "fisheries extension services, analogous to the Agricultural Extension Service, be established in order to facilitate transfer of technically useful information to fishermen at the local level."

Fish Protein Concentrate

The Commission recommends "expanded support for the BCF program to develop fish protein concentrate technology." (See CFR, Jan. 1969, on U.S. FPC Program.)

INTERNATIONAL FISHERY MANAGEMENT

The Commission concludes that the existing framework of international fisheries management "is seriously deficient." But it is not time to recommend "a single framework for the management of all the uses of the oceans." The Commission recommends that the U.S. propose:

"New international frameworks (principles, rules, procedures, and institutions) for the exploration and exploitation of the numerous resources underlying the high seas and the conduct of scientific inquiry in the oceans.

"Improvement and extension of the existing network of international fisheries agreements."

Specifically, the Commission recommends that the U.S. seek agreement in the International Convention for the Northwest Atlantic Fisheries (ICNAF, 14 nations, including U.S.) to collaborate with the Northeast Atlantic Fisheries Convention (NEAFC, 13 nations, but not U.S.) to fix a single, annual, overall catch limit for cod and haddock of the North Atlantic. This would include the whole ICNAF area and Region 1 of NEAFC area (East Greenland, Iceland, Northeast Arctic).

"This single annual overall catch limit," the Commission recommends, "should be designed to maintain the maximum sustainable yield of the fishery and, in turn, should be divided into annual national catch quotas. The overall catch limit should be adjusted regularly to take account of such factors as year-class fluctuations of the stocks, recovery of the stocks due to conservation measures, and errors in setting prior limits. Every participating nations should be authorized to transfer all or part of its quota to any other nation."

Further, the Commission recommends that the U.S. "take advantage of the opportunity presented by a quota system to rationalize its fishing effort in the North Atlantic."

And the Commission recommends that "early consideration be given to instituting national catch quotas for the high seas fisheries of the North Pacific."

The Report also contains these Commission recommendations on international fisheries:

- Coastal nations should have preferential access to marine resources off their coasts to reduce international tensions and the seizure of vessels. "It is not easy, however, to apply this principle in particular cases."

- Attempts should be made to agree on the maximum breadth of the territorial sea.

- International fishery organizations should be strengthened with more funds and staffs.

- Diplomatic efforts should be renewed to persuade all fishing nations to adhere to the Convention on Fishing and Conservation of the Living Resources of the High Seas.

MEMBERS OF THE COMMISSION

Chairman
Julius A. Stratton
Chairman
The Ford Foundation

Vice-Chairman
Richard A. Geyer
Head
Department of Oceanography
Texas A&M University

David A. Adams
Commissioner of Fisheries
North Carolina Department of
Conservation and Development

Carl A. Auerbach
Professor of Law
University of Minnesota Law School

Charles F. Baird
Under Secretary of the Navy

Jacob Blaustein
Director
Standard Oil Company

James A. Crutchfield
Professor of Economics
University of Washington

Frank C. DiLuzio
Assistant Secretary -
Water Pollution Control
U.S. Department of the Interior

Leon Jaworski
Attorney
Fullbright, Crooker, Freeman,
Bates and Jaworski

John A. Knauss
Dean
Graduate School of Oceanography
University of Rhode Island

John H. Perry, Jr.
President
Perry Publications, Inc.

Taylor A. Pryor
President
The Oceanic Foundation

George E. Reedy
President
Struthers Research and Development Corp.

George H. Sullivan, M.D.
Consulting Scientist
General Electric Reentry Systems

Robert M. White
Administrator
Environmental Science Services
Administration
U.S. Department of Commerce

Congressional Advisers

Norris Cotton
U.S. Senator

Warren G. Magnuson
U.S. Senator

Alton A. Lennon
U.S. Representative

Charles A. Mosher
U.S. Representative

UNITED STATES

U.S. Fishermen Get Protection Against Losses from Vessel Seizure

The Fishermen's Protective Act has been amended to cover losses sustained by owners of U.S. vessels seized by foreign countries on the basis of rights or claims in territorial waters or the high seas which are not recognized by the U.S. The Secretary of the Treasury, through the Secretary of State, will reimburse owners for fines, license or registration fees, or any other direct charges paid to secure release of the vessel and crew.

Protection Against Loss or Damage

Protection against other losses incurred as a result of seizure and detention will be provided through a Fishermen's Protective Fund, to be administered by BCF. These losses include damage to, or loss of, the vessel, its fishing gear or other equipment, and charges for dockage fees and utilities. Payment may also be claimed for the market value of fish or shellfish caught before seizure and confiscated or spoiled during detention, and for 50% of the gross income lost to owner and crew as a direct result of the seizure.

Eligibility and Fees

Any owner of a commercial fishing vessel documented or certified in the U.S. is eligible to apply for protection under this Fund by submitting an application form, and a fee of $60 plus $1.80 per gross ton. The fees will cover the administrative costs and one-third of claim estimated to be paid from the Fund.

Application forms and further information may be obtained from BCF's regional offices or from Bureau of Commercial Fisheries, Division of Financial Assistance, 1801 N. Moore St., Arlington, Va. 22209.

BCF Increases Calico Scallop Investigation

The Bureau of Commercial Fisheries is intensifying its investigation of the abundant, potentially important, calico scallop resource discovered off northern Florida in 1960 by Bureau scientists. BCF's Tropical Atlantic Biological Laboratory (TABL) of Miami, Fla., has joined in the work that has been conducted for 8 years by BCF's Pascagoula (Miss.) and St. Simon's Island (Ga.) exploratory fishing bases.

The scallop beds lie off Cape Kennedy and extend more than 200 miles, roughly from St. Augustine to south of Stuart, generally between 15 and 30 fathoms. BCF scientists hope for an annual production, in 5 years, of 15 million pounds worth an estimated $20 million. In the U.S., calico scallops (Aequipecten gibbus) apparently are confined to the southeastern coast and the Gulf of Mexico.

The Lab's Project

TABL's marine scientists assigned to the new program will seek biological understanding of the life history of the bottom-dwelling mollusc. As the fishery develops, information will be needed about "growth and reproduction rates, stock sizes, longevity, diseases to which the scallop may fall prey, and the marine environment in which the animal lives." Laboratory research will include attempts to rear the species artificially. The goal of TABL's biological studies will be to provide information and advice to the commercial industry that will help maintain a good supply of calico scallops and, when an intensive fishery has been activated, to protect it from overexploitation. Other BCF units will continue to work on exploratory fishing and gear research, technology, marketing, and statistics.

New Shucker Available

One problem that has slowed the development of a calico scallop fishery has been the lack of a mechanism that can efficiently shuck the relatively small shellfish. (A 75-pound bushel of live scallops yields only $3\frac{1}{2}$ to $6\frac{1}{2}$ pints of edible meats.) An automatic shucker

has been devised which could have a revolutionary effect on the beginning fishery. The combination shucker-eviscerator-cleaner can be installed aboard ship for rapid processing of scallop meat. Its inventor claims the apparatus can prepare scallops for the market--from shell to frozen meat--at the rate of 8 pounds of meat a minute. Also, at least 6 new factory-style vessels are nearly ready to enter the fishery; others are expected to be built or converted soon.

Related to Gourmet Scallop

The calico scallop is closely related, scientifically and dietetically, to the bay scallop, a seafood delicacy. The few people who have tasted the calico scallop claim it is as delicious as the somewhat-smaller bay scallop. The difference in meat size is due to an unusually large adductor muscle, the edible part of a scallop, which holds the 2 shell halves together. Calico scallops are called that because of their shells' mottled appearance.

Encouraging Fishing Results

Catches of calico scallops have been very small because of the lack of proper equipment and data concerning exact locations of commercial quantities. But some BCF findings may be a stimulant to commercial fishermen: During simulated commercial fishing from BCF's 'Silver Bay,' catches in 30-minute periods often amounted to more than 1,500 pounds; one reached 2,200 pounds. On a 6-day fishing cruise by BCF's 'Oregon,' the average catch was 1,600 pounds per hour. Once, the Oregon caught 5,800 pounds of scallops in an hour; at current retail prices, the catch would be worth more than $800.

Industrial Fish Will Be Sought Off Midatlantic Coast

BCF has made a 1-year, $95,000, research grant to the Virginia Institute of Marine Science (VIMS) to discover and test underutilized fish off the Midatlantic coast. Exploratory fishing operations were slated to begin in February 1969.

VIMS has chartered an industry vessel, the 'W. T. James, Jr.,' to locate winter supplies of marine herring. Initial fish scouting will be conducted between Cape Henry, Va., and Cape May, N.J., and off Long Island. Results will be relayed to the fishing industry as they are obtained.

1968 New England Food Fish Landings Declined

Preliminary data show that food fish landings for 1968 at principal New England ports totaled 344 million pounds; in 1967, the figure was 355 million. In 1968, New Bedford, Mass., led with 90 million, Gloucester had 75, and Boston was in third place with 60 million.

In 1968, industrial fish landings at those ports were up substantially--105 million pounds; in 1967, 97 million. The leader in 1968 was Point Judith, 44 million; followed by New Bedford, 36 million; and Gloucester, 23 million. In 1967, such landings at Gloucester were only 8 million pounds.

Cooling Trend in New England Waters May Be Over

The downward trend in sea-water temperatures of the New England fishing banks that began in 1953 may have stopped. This was reported by scientists of BCF's Woods Hole (Mass.) Biological Laboratory. Their analysis of temperature conditions in 1968 showed marked increases over 1967--as much as 1° C. for the annual average of inshore surface temperatures. Comparing September temperatures in 1968 with those in 1965 and 1966, they found inshore temperatures 1° C. higher and offshore temperatures up to 6° C. higher.

An important part of the Woods Hole study indicates that temperature trends are more than surface phenomena. The trends are related to movement of warm slope water onto the Continental Shelf. This thesis is supported by observations made by BCF's 'Albatross IV' and the U.S. Coast Guard's 'Evergreen' in the ICNAF environmental studies.

1968 Lake Erie Commercial Catch Shows Slight Increase

The commercial landings for Lake Erie in 1968 are expected to total over 49 million pounds, a slight increase from the 1967 catch, reports BCF. This increase results from larger catches in the Ohio and Ontario waters.

The 1968 lakewide landings, however, are still about average for the past 50 years. Canadian fishermen harvested more than 77% of the total, up 1% over 1967. Ohio fishermen harvested about 20%; Michigan, Pennsylvania, and New York totaled the remaining 3%. Until 1954, U.S. landings had always provided the majority of the catch. Thereafter, the U.S. catch declined steadily and commercial fishing became primarily a Canadian enterprise.

STATUS OF THE YELLOW PERCH

During 1968, there were excellent landings of yellow perch. The Lake Erie catch comprised over 26 million pounds: Canadian landings over 22 million; U.S. landings, slightly less than 4 million. Ohio's production is expected to total about 3 million pounds, slightly better than 1967. Michigan and Pennsylvania catches are also slightly higher and New York's lower. This continued "high level" of perch production in 1968 is attributed to the large influx of the strong 1965 year-class, which first entered the fishery in significant numbers. Analyses of the scale collections from BCF's sampling program indicate that this year-class, as III-year-old fish, contributed 39% of the total spring production. In the fall fishery, it contributed nearly 75% of the total catch.

The only previous strong year-class produced in the 1960's was hatched in 1962. These fish were responsible for high production from 1965 through 1967, but have now passed out of the fishery.

The 8-inch limit on perch put in effect several years ago continues to have considerable influence on Ohio landings. The sampling program revealed that approximately 39% of the fish in the spring fishery, and 55% in the fall fishery, were below $8\frac{1}{2}$ inches, the previous limit.

The growth rate of the yellow perch is as good or slightly better now than during the early 1960's. Then, yellow perch required a minimum of four complete growing seasons to reach 8 inches. At the end of 1968, the 1965 year-class of perch (completing their fourth year) averaged 8.2 inches; the 1966 year-class, 7.3 inches; the 1967 year-class, 5.9 inches; and the 1968 year-class, 3.7 inches.

The spawning success and survival of young perch has undergone considerable fluctuation during the past decade. Good hatches occurred in 1959, 1962, and 1965, but the hatch in 1966 was the lowest. The 1967 hatch was rated fair, followed by another weak year-class in 1968. The lack of a relative good year-class within the past 3 years is discouraging. These poor hatches, and low survivals from a stock more than adequate to replenish the population, point toward "deteriorating environmental conditions" as the contributing factor.

BCF concludes: "We can expect another good year in 1969, although the landings will undoubtedly be less than in 1968. A marked decline will follow in 1970 and continue until such time as another successful year-class is produced."

STATUS OF THE WALLEYE

Lake Erie walleye landings dropped from 1,258,000 pounds in 1967 to approximately 831,000 pounds in 1968, the third lowest since 1920. Preliminary 1968 figures for states and the Province of Ontario reveal: Ontario landed 311,000 pounds; Ohio, 304,000 pounds; New York, 120,000 pounds; Michigan, approximately 88,000 pounds; and Pennsylvania, about 8,000 pounds. Compared with 1967, the catch in Ohio increased almost 75 percent, while production in New York and Pennsylvania remained about the same. However, Ontario and Michigan both experienced a 58-percent reduction.

BCF's analysis of the 1968 landings in the lake's western basin showed the 1965 year-class, the last remaining strong year-class, constituted over 90% of the U.S. spring catch. However, fall landings revealed that the 1965 year-class accounted for only 32%. This year-class, which entered the commercial fishery during fall 1966, has contributed the following to the Ohio seasonal landings: fall 1966--5,000 fish; spring 1967--44,000; fall 1967--23,000; and spring 1968--127,000 walleyes. In fall 1968, however, the number of 1965 year-class walleyes in the Ohio catch

dropped to about 1,000 fish; this indicated this year-class was fairly well fished out. Other year-classes present in fall landings included the 1966 year-class (15%) and the 1967 year-class (53%). BCF notes: "We do not expect these relatively weak year-classes to contribute to the catch anywhere near the 1965 year-class."

The population in the lake's western basin has been experiencing good year-classes every 3 years (1959, 1962, and 1965). A substantial year-class hatch had been anticipated in spring 1968, but this did not occur. A sufficient number of spawning fish of the 1965 year-class were present, but for unknown causes the spawn did not hatch and survive.

The commercial fishing outlook for walleyes in the near future looks quite disappointing for the western basin. The industry will have to depend upon the weak 1966 and 1967 year-classes. Total lake production will probably drop to an all-time low in 1969 and may not reach 600,000 pounds.

On the other hand, landings in the eastern basin revealed a much healthier population as large mesh gill-net catches were composed of 8 to 10 age groups. A tagging program was conducted during the spring and fall fishing season of 1968. Over 2,500 walleyes of various ages were marked and released in hope that the recovered fish would provide an estimate of the population size, their seasonal movements, and the discreteness of the population.

Oregon Shipped Nearly 14 Million Coho Eggs in 1968

With the shipment of 500,000 coho eggs to Korea at the end of 1968, the Oregon Fish Commission completed a record season of egg-shipping operations. Almost 14 million eggs were sent to more than 20 State and Federal resource agencies throughout the U.S. during November and December. All were surplus to the Commission's needs.

The shipment to Korea was one of the official gifts promised her by Governor Tom McCall, who was head of the Oregon Trade Mission to Korea last November. It is hoped these eggs will help increase the salmon runs.

Requests for Eggs Soar

The requests for eggs have skyrocketed in recent years following the successful introduction of coho into Lake Michigan. Eggs from the Oregon Fish Commission were used there.

Ordinarily, the Fish Commission states, eggs that will be shipped by air a long distance are raised to the eyed stage, packaged in special styrofoam containers, and rushed to a jet flight--after telephoning or wiring the recipient of the time of arrival.

In addition to coho eggs, the Fish Commission sent 1.4 million spring chinook eggs to Washington's Department of Fisheries and 400,000 to the Oregon Game Commission.

Aircraft Planted 4.1 Million Trout in California in 1968

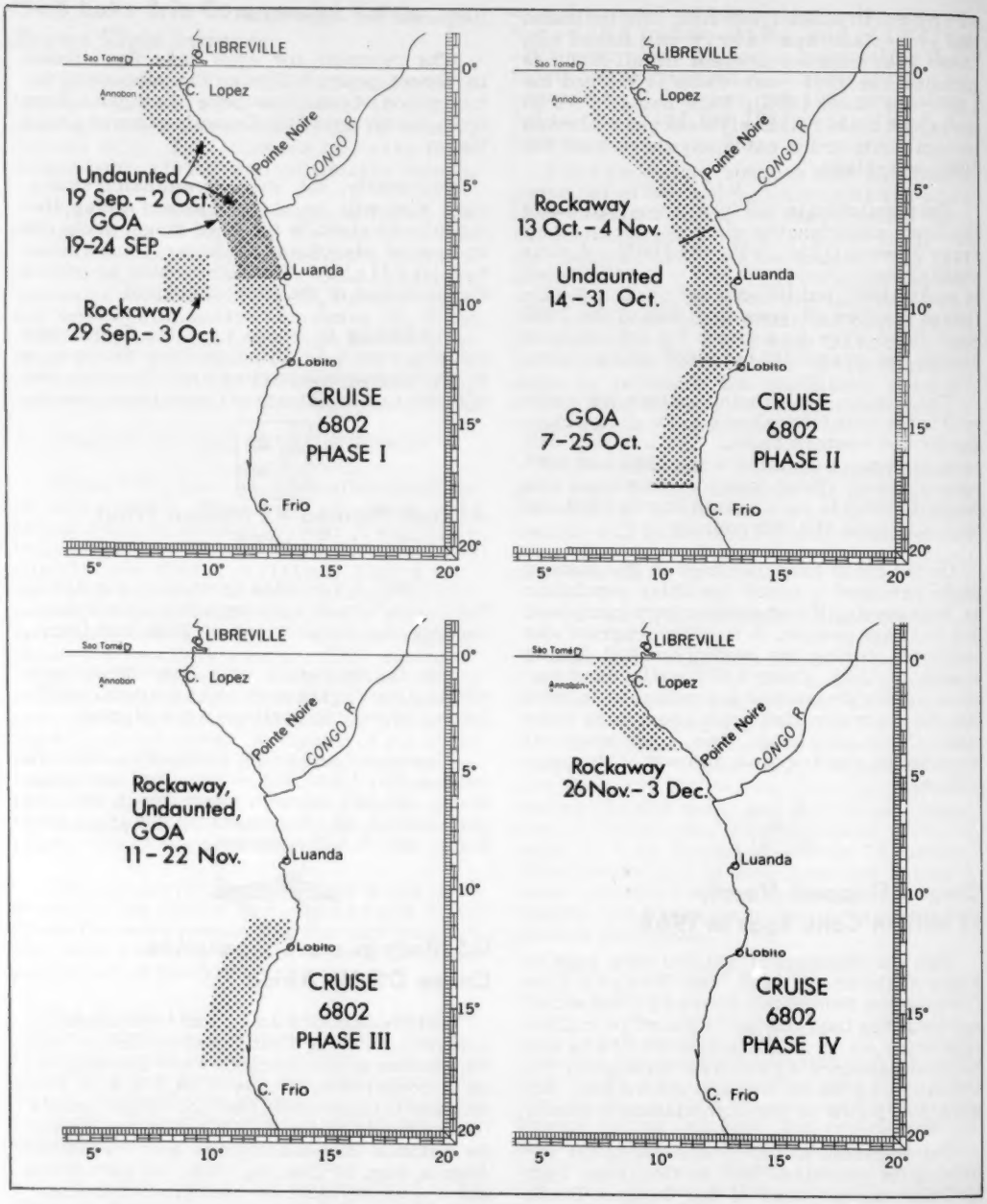
In 1968, 4.1 million trout were planted in California's back-country waters by airplane, reports the Department of Fish and Game.

The Department's twin Beechcraft made 93 planting flights covering a total of 871 lakes. Mostly fingerlings were planted.

Plantings included 1,288,400 kokanee salmon fry, 1,565,507 rainbow and kamloops trout, 497,942 eastern brook trout, 567,000 golden trout, 25,150 browns, 12,000 eagle lake trout, and 53,500 cutthroat.

U.S.-Portuguese Cooperative Cruise Off W. Africa

Distribution of tunas and oceanographic conditions off the West Coast of Africa from the equator south to Angola were investigated on a cooperative cruise of BCF's R/V 'Undaunted' (cruise 6802), the U.S. Coast Guard's 'Rockaway,' and the R/V 'Goa' of the Missao de Estudos Bioceanologicos e de Pescas de Angola, Aug. 20-Dec. 18, 1968. As part of the survey, the physical and biological characteristics of the Gabon-Angola front, which moves from the Equator south to off Angola in the southern spring months, were investigated.


LIBREVILLE
São Tomé
Annobon
C. Lopez
Pointe Noire
CONGO R.
Undaunted
19 Sep.– 2 Oct.
GOA
19–24 SEP.
Rockaway
29 Sep.– 3 Oct.
Luanda
Lobito
CRUISE
6802
PHASE I
C. Frio
0°
5°
10°
15°
20°
5°
10°
15°
20°
LIBREVILLE
São Tomé
Annobon
C. Lopez
Pointe Noire
CONGO R.
Rockaway
13 Oct.– 4 Nov.
Undaunted
14 – 31 Oct.
GOA
7–25 Oct.
Luanda
Lobito
CRUISE
6802
PHASE II
C. Frio
LIBREVILLE
São Tomé
Annobon
C. Lopez
Pointe Noire
CONGO R.
Rockaway,
Undaunted,
GOA
11 – 22 Nov.
Luanda
Lobito
CRUISE
6802
PHASE III
C. Frio
LIBREVILLE
São Tomé
Annobon
C. Lopez
Pointe Noire
CONGO R.
Rockaway
26 Nov.– 3 Dec.
Luanda
Lobito
CRUISE
6802
PHASE IV
C. Frio

The frontal movement, its definition by specific isotherms, and the association of tunas with the front were parts of the study.

Tuna Schools Mostly Skipjack

A total of 125 tuna schools were observed, primarily in a restricted coastal band from the Congo River south to Angola. The fish were predominantly skipjack, but yellowfin and other species of tuna also were present. The yellowfin schools occurred in waters warmer than about 23° C. (73° F.), but skipjack were found in waters as cool as 20° C. (68° F.). Preliminary study did not show the tuna in close association with the front, possibly because of the weak nature of this feature during the cruise period.

Commonwealth of Puerto Rico Plans Commercial Fishery Lab

The Puerto Rico Planning Board has approved the preliminary drawings of a commercial fishery laboratory to be built at Punta Guanajibo, south of Mayaguez, on the west coast. The lab will be headquarters for the commercial fishery research and development program of Puerto Rico. This is supported by the Department of Agriculture of the Commonwealth of Puerto Rico and the U.S. Department of the Interior under Public Law 88-309.

Under the development program, several projects are underway to promote the fishing industry. These include demonstration and testing of improved boats and fishing gear, collection of fishery statistics, training of fishermen aboard tuna clippers, and experimental fishing for tuna in the Caribbean Sea and adjacent waters.

The Laboratory

The laboratory will include space for studies related to exploratory fishing, fishing gear, processing and preserving fish, and marine biology. It also will contain a library, assembly room, and administrative offices.

Facilities for docking, and a shipyard, will be constructed near the lab by the Atomic Energy Commission for the University of Puerto Rico Nuclear Center on Puerto Rico (Department of Agriculture property).

Much Fishery Legislation Proposed in Congress

The "hoppers" of the 91st Congress already contain a fair-sized catch of bills concerning fish and their environments and fishery products:

• Marine Sanctuaries

Five bills were introduced in the House to authorize the Secretary of the Interior to study the most feasible and desirable means of establishing certain portions of the tidelands, Outer Continental Shelf, seaward areas, and Great Lakes of the U.S. as marine sanctuaries.

The bills were introduced by Reps. Boland, Mass. (H.R. 145), Wyman, N.H. (H.R. 727), Brown and Keith, Calif. (H.R. 5955 and H.R. 5824), and Rep. Tunney, Calif., who included bays and estuaries (H.R. 6059).

Rep. Brown also introduced H.R. 5956 to authorize the Secretary of the Interior to study the feasible and desirable means of establishing a marine sanctuary in the Santa Barbara Channel, California.

• Territorial Waters and Fishing Zones

Reps. Pelly, Wash., and Clausen, Calif., introduced H.R. 506 and H.R. 3785--to establish fishing zones of the U.S. beyond its territorial seas. Rep. Pelly also introduced H.R. 509 to amend the act prohibiting fishing in U.S. territorial waters by non-U.S. vessels in order to expand the definition of "fisheries."

• Inspection and Labeling

Rep. Sullivan, Mo., introduced H.R. 1235 to protect the public health by amending the Federal Food, Drug, and Cosmetic Act. His bill amends certain labeling provisions. . .to assure adequate information for consumers, including cautionary labeling of articles where needed to prevent accidental injury. . . to provide additional authority to insure wholesomeness of fish and fishery products; etc.

Rep. Pepper, Fla., introduced H.R. 3683--to regulate interstate commerce. . .to provide inspection of facilities in harvesting and processing fish and fishery products for commercial purposes; inspection of fish and fishery products; and for cooperation with States in regulation of intrastate commerce with respect to State fish-inspection programs.

Rep. Pepper also introduced for himself and Rep. Dingell, Mich., H.R. 5550. It is designed to protect consumers and to assist the commercial fishing industry through inspection of establishments processing fish and fishery products.

Rep. Pelly, Wash., introduced H.R. 505. This would require imported fish and fishfood products made completely or partly with imported fish to bear a label showing country of origin.

• Imports

Rep. Pelly introduced H.R. 510. Its purpose is to amend U.S. Tariff Schedules to provide that the amount of groundfish imported shall not exceed average annual amount imported during 1963 and 1964.

• Landings and Processing by Foreign Vessels

Rep. Pelly introduced: 1) H.R. 1272. This seeks to prevent certain foreign-flag vessels from landing catches of fish in U.S. ports, also territories, possessions, and Commonwealth of Puerto Rico.

2) H.R. 507: to prohibit processing of fish in U.S. territorial waters by non-U.S. vessels, except when it is determined that no adequate U.S. processing facilities are available.

• Aid and Assistance to U.S. Fishermen

Rep. Pelly introduced H.R. 1270. This would authorize Coast Guard to protect and assist U.S. vessels fishing on high seas.

Rep. Pelly also introduced H.R. 508--to decrease permissible minimum down-payment for fishing vessels.

Rep. O'Neill, Mass., introduced H.R. 1268. This bill would authorize liens of value of secured equipment used solely for navigation or fishing on a U.S. vessel--and to permit recording of such liens.

• Pesticides

Rep. Dingell, Mich., introduced H.R. 1057: to prevent or minimize injury to fish and wildlife from insecticides, herbicides, fungicides,

and pesticides, etc.; also H.R. 1059: to provide for advance consultation with Fish and Wildlife Service and State wildlife agencies before any Federal program begins involving the use of pesticides or other chemicals designed for mass biological controls.

• Pollution

Rep. Dingell, for himself and Rep. Karth, Minn., introduced: 1) H.R. 1058. This would protect fish, wildlife, and recreation from damages resulting from discharge of heated effluents into certain waters; 2) H.R. 1060 to require certain vessels in U.S. navigable waters to conform to standards of waste disposal; and 3) H.R. 1062: to control pollution from vessels and other sources in Great Lakes and other U.S. navigable waters.

Rep. Cahill, N.J., introduced H.R. 2155 and H.R. 2156. These would give President authority to alleviate or remove threat to navigation, safety, marine resources, or coastal economy by releases of fluids or other substances carried in ocean-going vessels, etc. He also introduced H.R. 2157: to provide Coast Guard with authority to conduct research and development to deal with release of harmful fluids carried in vessels.

Rep. Tunney, Calif., introduced H.R. 6296. It would create commission to make comprehensive study of discharge of oil and other pollutants from vessels, onshore and offshore facilities, and other sources, into or upon navigable waters of U.S. or adjoining shorelines.

Rep. Horton, N.Y., introduced H.R. 6019: to authorize grants for research and development of methods to abate pollution of Lake Ontario, Lake Erie, and for other purposes.

• Anadromous Fish

Rep. Dingell, Mich., introduced for himself and others H.R. 1049. This would contribute to conservation and enhancement of U.S. anadromous fishing resources--and encourage joint research and development projects.

Rep. Pelly introduced H.R. 309: to conserve and protect Pacific salmon of North American origin.

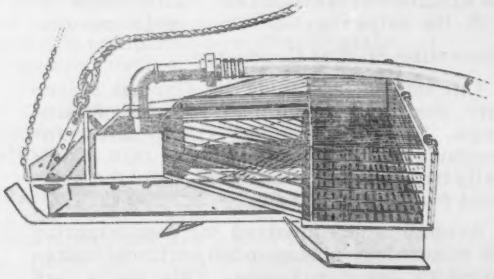
--Barbara Lundy

HYDRAULIC OR JET DREDGES

With this type of equipment, surf, soft, or hard clams are washed out of the bottom by action of jets of water from a pipe attached in front of the tooth bar. The pressured water is supplied by a high powered pump on the fishing vessel. The shellfish are then either washed on to, or collected by the tooth bar of the dredge. The Maryland type of hydraulic dredge utilizes a conveyer which brings the soft clams up to the vessel.

Hydraulic or jet dredge, surf clam

Hydraulic or jet dredge, soft clam



Hydraulic or jet dredge, hard clam

Note: Excerpt from Circular 109, Commercial Fishing Gear of the United States, for sale from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402, single copy 40 cents.

OCEANOGRAPHY

International Scientific Expedition Drifts Across Atlantic

In February 1969, U.S., British, and West German scientists spent 3 weeks aboard 4 vessels drifting across the equatorial region of the Atlantic Ocean. They were studying in detail the interaction of sea and air where the tradewinds generate much of the weather for North America and Europe. The study is called the Atlantic Tradewind Experiment (ATEX).

By drifting, rather than sailing, the scientists hoped to conduct their sea/air experiments--and measurements of air and water motions--without the problem of ship movements.

The vessels were ESSA's 'Discoverer,' the British Navy hydrographic survey ship 'Hydra,' and the West German research ships 'Meteor' and 'Planet.' Several German scientists were aboard the U.S. vessel.

The Operation

The 4 ships met off Africa about 850 miles west of Dakar and 600 miles west of the Cape Verde Islands to synchronize instruments. Three vessels then took stations at the corners of an equilateral triangle 435 miles on a side, with the fourth vessel centered on the downwind (South American) side. The vessels began drifting southwestward with the prevailing winds and currents. The ships drifted about 550 miles towards the mouth of the Amazon River off Brazil. At the end of the drift, the ships regrouped to compare results.

Interesting Studies Conducted

One interesting study, by German scientists, dealt with the number and size of raindrops. The results could lead to better understanding of different kinds of rain, especially tropical, and to answers about the artificial production of rain.

Another study involved the concentration and mineralogy of suspended sediment transported by ocean currents. This study may provide information on source of deep-sea deposits. It was conducted along with airborne particle studies.

A third study involved internal waves, the mysterious underwater undulations of the sea.

Hawaii Will Get New Experimental Tsunami Warning System

An experimental system will be set up in Hawaii to try to improve the existing system that warns Hawaiians of seismic sea waves (tsunamis) generated by undersea earthquakes near their coasts. It is hoped the new additional system will provide information sooner.

The program, announced Feb. 11 by the Environmental Science Services Administration (ESSA) of the U.S. Department of Commerce, will be established by ESSA and the University of Hawaii under a $45,700 contract.

The New System

The experimental system will consist of seismic and hydraulic gage stations on several islands. The stations' signals will be telemetered by radio to the observatory of ESSA's Coast and Geodetic Survey (CGS) at Ewa Beach, Oahu.

The system will supplement the existing seismic quadripartite warning net on Oahu. The net is part of the CGS Pacific tsunami warning system. Three seismic stations will be established on the Big Island in cooperation with the U.S. Geological Survey's Hawaii Volcano Observatory; a fourth will be installed on Maui. The system will also use the present hydraulic gage near Kona on Hawaii Island, plus a new one to be installed on the island near Punaluu.

Also, a permanent, ocean-bottom, tsunami recorder using a mid-ocean pressure sensor will be placed under an ocean station ship north of the Hawaiian Islands. The pressure sensor will telemeter wave-height data from sea bottom to ship. From there, the signals will be relayed to the Ewa observatory for analysis.

Swifter Action Expected

Robert A. Eppley, Chief, Tsunami Services Coordinating Branch, Coast Survey headquarters, Rockville, Md., said:

"Having this information immediately available from the continuous recordings at the stations should make it possible, if a large earthquake occurs near the Big Island, the most active seismic area, for the observatory to act swiftly. The seismic data will enable the observatory to determine the earthquake's epicenter and the data from the hydraulic gages will be used to determine if a tsunami has been generated and, in the case of Aleutian tsunamis, to evaluate the wave height as it approaches Hawaii."

If the experimental system provides reliable results, it will be added to the Pacific tsunami warning system. This would reduce appreciably the time in which a warning can be issued.

Eppley said, too, there was always the possibility of a tsunami being generated by an undersea earthquake in the ocean adjacent to Hawaii. Such a tsunami about 100 years ago off the southeast coast of the island of Hawaii caused considerable damage.

"THERMOMETER" TAKES SEA'S TEMPERATURE

The mighty ocean is having its temperature taken in measurements as precise as five-hundredths of a degree Fahrenheit.

The "thermometer", explained Arthur Nelkin, manager of electro-acoustics research, Westinghouse Research Laboratories at Pittsburgh, changes electrical pulsations from deep in the ocean into mechanical vibrations of ultrasonic frequency that can be measured on the sea's surface.

The transducer contains a small aluminum disk, about an inch in diameter, which has a natural vibrating frequency of about 40,000 vibrations per second. This disk is lowered into the ocean, attached to two wires which feed it direct current power.

Set in motion by a transistorized electronic circuit, the disk fixes the frequency at which the circuit produces electrical pulsations. These pulses are sent along the wires to receiving equipment on a ship or platform at the water's surface, where they are counted.

The disk's natural vibration rate changes with the ocean's temperature. Temperatures are measured by observing the corresponding shift in frequency of the electrical oscillations.

Accurate knowledge of the ocean's temperatures is aiding scientists in their extensive study of ocean depths and man's relation to the sea. For example, small changes in water temperature are known to affect the performance of sonar systems. (Reprinted, with permission from "Science News," weekly summary of current science, copyright 1966, by Science Service, Inc.).

Foreign Fishing Off U.S. Coasts in December 1968

NORTHWEST ATLANTIC

Thirty-six Soviet, Polish, and Icelandic fishing and support vessels were sighted in December 1968, far fewer than the 92 reported early in November. Due to a complete withdrawal of East and West German fleets and reductions in Soviet and Polish fleets, only 10 or 12 remained at end of November. In December, weekly sightings varied between 10 and 20 vessels.

Soviet: Twenty-nine individual vessels were sighted. Most were concentrated in a 20-mile area, 20 to 30 miles south of Martha's Vineyard and Nantucket. They were observed actively fishing, probably for herring, but no catches were identified.

Polish: Six vessels were sighted, in contrast to 19 in November. Early in the month they fished briefly 25 to 30 miles south of Martha's Vineyard and Nantucket. Limited catches of herring were observed. Two Polish vessels fished briefly south of Block Island, R.I., early in Dec. 1967.

East and West German: There were no sightings in December 1968. In early December 1967, 1 East German and 8 West German stern trawlers fished 15 and 30 miles south of Montauk Point, L.I. By mid-month, they were reported fishing off the New Jersey Coast. At month's end, there were no further sightings or reports of these vessels.

Icelandic: One herring purse seiner sighted.

MID-ATLANTIC

Several Soviet stern factory trawlers were reported southeast of Cape May, N.J., and off the Virginia coast, probably conducting exploratory fishing.

GULF OF MEXICO AND SOUTH ATLANTIC

No foreign fishing vessels were reported.

OFF CALIFORNIA

No Soviet fishing vessels were sighted in December 1968; 18 were sighted in December 1967.

OFF PACIFIC NORTHWEST

Soviet: Three fishing vessels were sighted--1 medium side trawler, 1 research vessel, and 1 large stern factory trawler. No catches were observed.

Japanese: One long liner was sighted, but no fish were observed aboard.

OFF ALASKA

Soviet: Soviet fishery vessels increased rapidly, from 34 in November 1968, to over 110 by the end of December. Number of vessels also had increased rapidly in December 1967, from 20 early in the month to about 70 by the end.

The winter herring fishery began earlier in 1968 than in previous years--the principal reason for the increase in sightings. Their Bering Sea flounder fishery also started early in December.

A fleet of 11 stern trawlers, 1 medium trawler, and 5 support vessels, observed fishing ocean perch in the western Gulf of Alaska during the first 3 weeks in December, had shrunk to 6 stern trawlers by year's end. Many of the vessels offloaded in the Sanak Island loading zone. Ocean perch fishing in other areas off Alaska was limited.

In early December, 5 stern trawlers started fishing herring northwest of the Pribilofs; by month's end nearly 30 vessels were sighted there. The Soviets did not fish Pribilof Island herring in 1966 and 1967; in 1968 they caught about 10,000 metric tons. In December the best stern factory trawlers were landing 35-50 metric tons a day, and some medium trawlers were averaging 12-13 tons, on a good day. Some medium trawlers, with limited refrigeration capabilities, reportedly were having difficulty as they could freeze only about one-half their average daily catches.

About 10 vessels began fishing flounder in early December; by month's end there were over 50. In recent years Soviet flounder expeditions have developed into one of their most intensive fisheries off Alaska.

Throughout December the Soviets trawled for groundfish along the Continental Shelf edge in the Bering Sea. One group of 5 medium trawlers operated in the central Bering Sea. North of the Fox Islands in the eastern Aleutians a second group, 6 medium trawlers, was

joined by 9 sisterships and 2 refrigerated vessels early in December. This second group was visited by a BCF management agent late in the month. The Soviet Commander confirmed that flatfish was the principal catch. For example, on the vessel he was on 95% of the catch was arrowtooth flounder (frozen whole).

Japanese: About 40 vessels were sighted in December.

Six stern trawlers fished ocean perch, mostly in the eastern Gulf of Alaska. Twelve to thirteen stern trawlers fished perch along the Continental Shelf edge from Unimak Pass to the central Bering Sea.

Two factoryship fleets continued the fish meal and oil and minced-fish-meat fishery in the eastern Bering Sea throughout December. One factoryship and 8 trawlers fished along the Continental Shelf edge from north of the Fox Islands to south of the Pribilofs--proven pollock fishing grounds. The second factoryship and 6 trawlers remained north of the Alaska Peninsula--an area of flounder concentrations.

About 4 vessels long lined for sablefish off southeast Alaska during the month.

South Korean: In late December, a stern trawler appeared near the eastern Aleutians. In June and July 1968 the same vessel had fished north of the Alaska Peninsula.

DO YOU KNOW?

The sea lamprey or "lamprey eel," scourge of the Great Lakes, is not an eel. It is a primitive, aquatic, vertebrate that has no jaws or paired fins.

The "mouth," a sucking disc by which the animal attaches to a fish, is surrounded by teeth that are used to rasp a hole through the victim's skin.

Originally, the sea lamprey spent its entire life in salt water and spawned in fresh water. However, the lampreys of the Great Lakes now spend their entire lives in the lakes and adjoining streams.

The nonparasitic young, called ammocetes, remain for several years buried in mud bottoms of the streams. Emerging from the mud as adults, they migrate into the lakes. Later, the lampreys return to the streams to spawn before dying.

Adult lampreys have been responsible for destruction of lake trout, burbot, and whitefish populations of Lakes Superior, Huron, and Michigan. The lamprey population has been reduced more than 85 percent in Lakes Superior and Michigan by chemical control methods recently developed by the Bureau of Commercial Fisheries and applied in a joint U.S.-Canadian control program by personnel of the Bureau of Commercial Fisheries and Department of Fisheries, Canada. As a result, fish stocks in these lakes are now being restored, aided by plantings of hatchery-reared fingerlings.

--Catherine Criscione

ARTICLES

JAPANESE LONGLINE FISHERY IN GULF OF ALASKA

Jim H. Branson

Since early 1964, Japanese longline vessels have maintained a fishery for sablefish in the Gulf of Alaska. This fishery remained stable at 8 ships through the first 3 years. In 1967, however, the number of ships jumped to 23, which made at least 30 trips. In 1968, the number was 21 ships and over 43 trips. The catch has increased from 4 million pounds annually in 1964-66 to an estimated 20 million pounds in 1968.

The gear used by the Japanese is capable of taking halibut. Only short distances separate their sablefish operations from some of the best halibut grounds in the North Pacific. For this reason, these ships have been boarded and inspected, whenever possible, by Bureau of Commercial Fisheries personnel, acting under the authority of the International North Pacific Fisheries Convention. To date, only one ship has been found with halibut aboard, and there is reason to believe those fish may have been taken in the Bering Sea. 1/

Available information indicates the Fisheries Agency of Japan did not license any longliners to fish in the Gulf until September 1967. Prior to that time, in fact, the Agency had punished some ships for fishing there without licenses.

The typical Japanese longliner works alone. It makes trips lasting as long as 3 months, dresses and freezes the catch as it comes aboard, and returns to Japan only when it has a full load. This may be as much as 300 metric tons. The vessels observed in the Gulf of Alaska have hailed from many different ports, and most are owned by small companies or individuals.

The recent increase in the number of Japanese ships in this fishery, some new and apparently designed for fishing in northern waters, may signify increased interest in the sablefish resource of the Gulf. To date, there appears to be little decrease in fishing success, which has been uniformly high since the fishery began.

DEVELOPMENT OF THE FISHERY

The first confirmed sighting of a Japanese longline vessel in the Gulf of Alaska was in April 1964, southwest of Unimak Island. By the end of 1964, 8 different ships had been sighted in the Gulf, some as far east as Middleton Island (long. 146° W.).

By March 1965, Japanese longliners had extended their fishing to the waters off southeastern Alaska, as far east as long. 135° W. Eight individual vessels were identified in 1965.

The fishery did not expand in 1966; in fact, only 7 individual vessels were involved. The effort, however, shifted east again; almost all sightings were made east of Kodiak Island, principally on Middleton and Chichagof grounds.

In 1967, fishing effort more than doubled. Twenty-three boats were reported in the Gulf of Alaska and some made 2 or even 3 trips during the year. Fishing effort was still concentrated east of Kodiak Island, the bulk on Middleton and Chichagof grounds.

In 1968, 22 longliners were licensed by the Japanese Fisheries Agency to fish in the Gulf of Alaska. At least 21 vessels made a total of over 43 trips. Fishing effort shifted even further east: all but 7 expeditions concentrated on the Chichagof grounds.

Observations of this fishery by BCF personnel over the past 4 years indicate the catch is almost entirely sablefish (Anoplopoma fimbria). There also are a small percentage of rockfishes (Sebastodes sp.) and an occasional halibut (Hippoglossus stenolepis).

Mr. Branson is Supervisory Fisheries Management Agent, BCF, Office of Enforcement and Surveillance, Kodiak, Alaska.

1/In early Feb. 1969, a second Japanese longline fishing vessel 'Daiei Maru No. 85' was seized for violation of the Convention. The vessel was fishing in the eastern Gulf of Alaska and had halibut aboard.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 834

Fisheries Management Agents have observed halibut on Japanese longline gear on only 2 occasions since the fishery started in 1964; in both cases, the fish were shaken off the gear without being brought aboard. It appears that only a very small percentage of the catch will be halibut--as long as fishing is confined to 200 fathoms or more, as almost all is.

FISHING GROUNDS AND METHODS

Japanese longline grounds in the Gulf of Alaska can be separated into 7 major areas (fig. 1). These start in the west at approximately long. 165° W. with the banks south of Unimak Pass, progress east through the Shumagins, Chirikof, Kodiak, Middleton, Yakutat, and end with Chichagof at about long. 135° W. All are adjacent to, but outside (deeper), extremely good halibut grounds. slope to abyssal depths. The longliners generally attempt to put their gear on this shelf.

The gear used for sablefish in the Gulf is identical to that used by the Japanese in their longline fishery for halibut in the Bering Sea. Hooks, groundlines, etc., are the same size, and squid is the preferred bait for both species. A unit of gear, called a "set," consists of 80 to 100 meters of approximately $\frac{5}{16}$-inch diameter groundline coiled in a flat wicker and grass basket. Branch lines, or "gangings" in the U.S. fisherman's terminology, are slightly less than 1 meter long; these are placed about 2 meters apart along the groundline, giving an average of 40-50 hooks to the basket. Two hundred fifty to 300 of these sets are tied together to comprise a "longline" that may be 20 miles long.

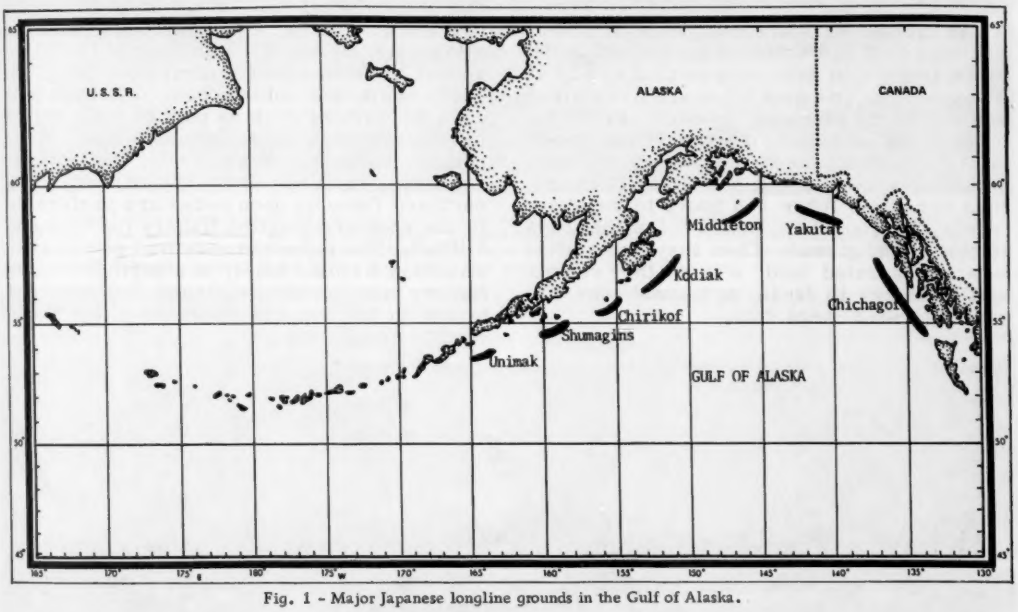


Fig. 1 - Major Japanese longline grounds in the Gulf of Alaska.

The average depth fished by the longliners has been 300 fathoms, although gear has been observed as shallow as 150 fathoms and as deep as 550 fathoms. The line is set along the contours of the bottom rather than across, so most of a set will be at the same average depth. Throughout most of the 7 Gulf areas, there tends to be a narrow shelf ranging from 250 to 350 fathoms, between the break of the Continental Shelf at 100 fathoms and the final

The gear is set through an opening at or near the stern, while the ship is underway at 6 or 7 knots; the ends of the line are marked with buoyed flags and, usually, a radio transmitter buoy. In addition, a buoyed flag may be attached every 100 baskets or sets. The ends of the mainline are anchored. A rock, about the size of a grapefruit, is placed at the junction of each set to hold the groundline on the bottom. The gear is left to soak for

around 5 hours and then picked over a power line hauler or "gurdy." Hauling proceeds at about 3 miles or less per hour, so gear recovery time runs from 6 to 8 hours. The line hauler is positioned on the main deck, usually on the starboard side just forward of the wheelhouse, along with the fish bins and cleaning tables.

The mechanics of the fishing operation are basically the same as those used by U.S. and Canadian longline fishermen. However, because of the small units of gear and the use of baskets, etc., it wastes considerably more manpower. Instead of 6-12 men aboard a comparable U.S. vessel, the Japanese ships average 26-28 men. The Japanese boats are considerably larger than those used in the North American halibut fishery, ranging from 120 to 185 feet.

As the sablefish are brought aboard, they are headed and eviscerated and put in flat metal trays that hold approximately 40 pounds. The loaded trays are placed on shelves in an air-blast freezer usually located on the main deck underneath the wheelhouse. The sharp freeze capacity of the vessels inspected has run from 6 to 12 metric tons per day. After 5-8 hours in the sharp freeze, the fish are knocked out of the trays in blocks and glazed. Then they are shifted to a refrigerated hold, where they remain until delivery in Japan, or transshipment to a refrigerated cargo ship.

VESSELS AND CATCHES

All the ships in the Gulf of Alaska longline fishery have been standard Japanese longliners. These ships have engine, quarters, and pilot house aft, a large working deck running from front of the wheelhouse forward, and equipped with one or more vertical shiv line haulers on the starboard side of the main deck, just forward of the superstructure. They have ranged from 120 to 185 feet long and from 211 to 534 gross tons. All are equipped with refrigeration, and head, eviscerate, and freeze their catch on the grounds. Refrigerated-hold capacity varies from 100 to over 300 metric tons.

Until late 1966, all ships observed in the Gulf had open working decks. These make aerial observation of their catches reasonably easy. In fall 1966, however, a few ships arrived with covered work spaces. These allow only the briefest glimpses of fishing operation from a patrol aircraft or ship. In 1967, some new ships appeared to have this covered working deck as part of their original construction, rather than as a later, temporary, addition. Presumably, the working deck on a longliner is covered only for a northern fishery; open decks are preferable in the southern longline fishery for tuna and billfish. The appearance of original construction aimed solely at a northern water fishery may herald increased Japanese interest in the longline fisheries of the North Pacific and Bering Sea.

Fig. 2 - The longliner, 'Asahi Maru #7,' hauling gear in Gulf of Alaska. Typical of most longliners fishing sablefish off Alaska: machinery and crew spaces are aft, sharp-freeze compartments underneath the wheelhouse, and open working deck. Built in 1963, it is 192 gross tons, 128 feet long, powered by a 6 cylinder slow-speed diesel, and has a crew of 24. The baiting shelter is visible on the stern; so is opening from which gear is set.

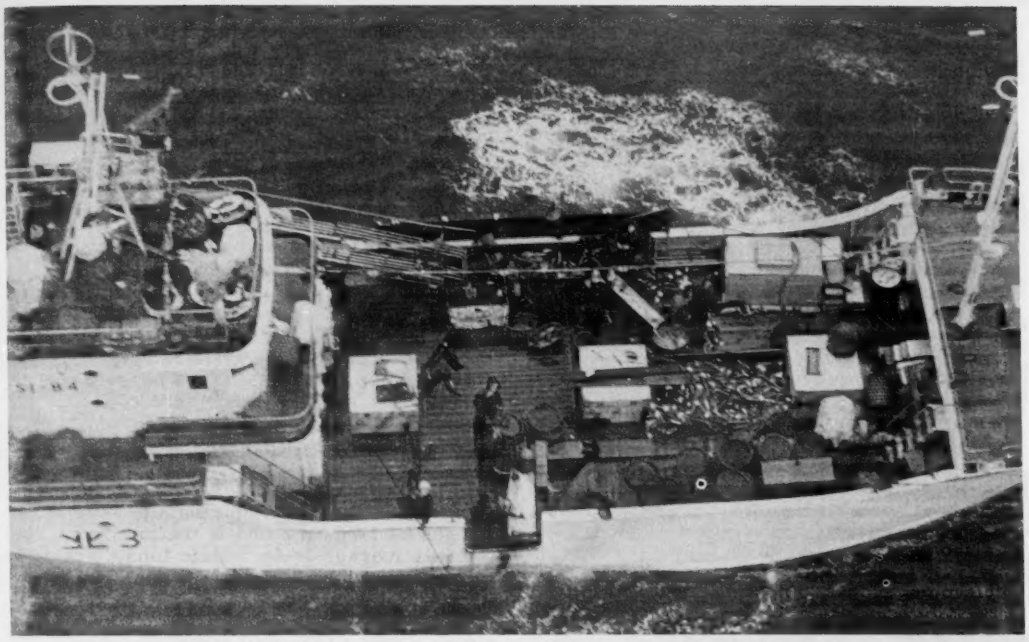


Fig. 3 - Typical deck arrangement for Japanese longliner working sablefish. The line is brought in through cut in bulwarks on starboard side. The fish are dressed on table on port side. Headed and gutted sablefish are visible in bin between #1 and #2 hatch. The rectangular metal freezer trays are visible stacked against break on foredeck. The pipe chute on portside leading aft is used to move baskets of longline gear aft to the baiting shed, where they are recoiled, baited, and reset.

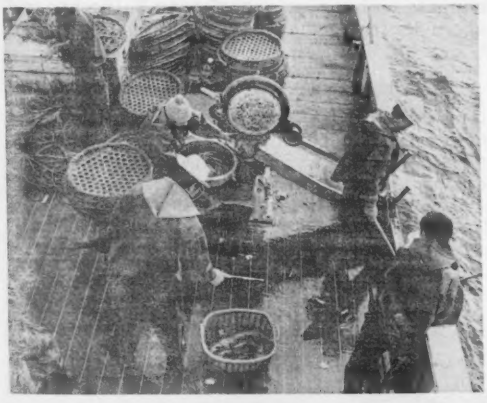


Fig. 4 - The gurdy operator watches longline as it comes aboard over vertical hauling shiv. He gaffs fish and removes them from hook. The fisherman, right foreground, uses long bamboo pole with gaff hook on end to retrieve fish that may fall from gear as they break water. Crewman sitting directly behind gurdy coils skates or sets of the longline in a metal wash pan as they come over gurdy breaking each skate as it comes aboard. When he has one skate in wash pan, he dumps it into flat wicker baskets piled alongside him. Crew member with small gaff hook and basket is picking fish off deck, where they are dropped by gurdy operator. He moves them in basket to dressing tables on portside.

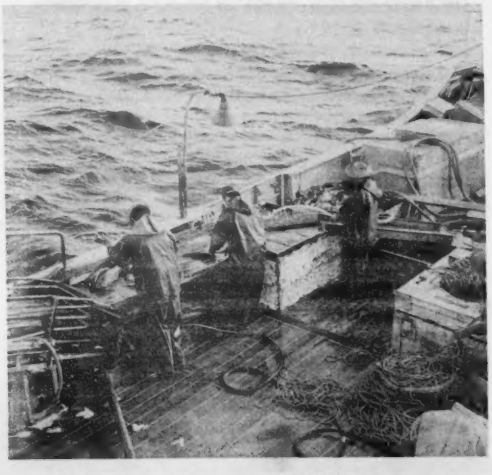


Fig. 5 - The butchering table on portside with gear-return chute visible on left. Fish are headed, eviscerated, and washed with sea water. Then they go down chute on right side into tub full of circulating water. From there they go either to a temporary storage bin or directly into freezer pans. Crew member on extreme right is untangling at least 6 or 7 baskets of longline probably fouled during setting operation.

Fig. 6 - The Japanese longliners dress fish by cutting off head and pectoral fins and then eviscerating without making slit in belly. Fish washed and ready for freezing are in bin in foregound.

Fig. 7 - Crew members bait longline gear with small pieces of squid. A 2-pound squid furnishes about 20 to 25 baits. Gear is set in opening, in background, by moving baskets down long wooden chute. A crew member turns baskets as they are being set, so hooks do not become tangled with gear by dragging across it.

Judging from their registry numbers, the ships observed in the Gulf over the past 5 years have come from at least 7 different prefectures in Japan. Over 13 different owners have been identified, mostly small companies or individuals, although some larger companies, such as Hokoku Suisan K.K., have been represented.

The length of a single fishing trip varies from 6 to 12 weeks; the average is around 9-10 weeks. Traveling time between Japan and the grounds in the middle Gulf of Alaska is 18 or 19 days. Prior to 1968, there was no resupply of the longliners by support ships or other fishing vessels. Recently, however, the Japanese Government has permitted both resupply and transshipment of the catch. Many fishing vessels take advantage of it to stay on the grounds for extended periods.

The average daily catch, according to captains interviewed during the boardings, ranges between 2 and 8 metric tons; the overall average is $4\frac{1}{2}$ metric tons. The size of the individual fish varies from $2\frac{1}{2}$ to over 10 pounds, with the average around 6-8 pounds. There has been little or no reported or observed decline in either daily catch or average size since the first observations in 1964. Generally, success seems to be high in this fishery. BCF personnel have made repeated observations of gear being brought aboard with as many as 75-80 percent of the hooks holding fish.

The yearly take of sablefish by Japanese longliners from the Gulf of Alaska probably averaged about 4 million pounds a year for 1964, 1965, and 1966. This jumped to approximately 12 million pounds in 1967, and again to 18-20 million pounds in 1968. These figures are based on an average vessel capacity of 200 tons and a full load for each trip. The number of trips per year that can be identified were, respectively, 11, 10, 9, 30, and 43. As a comparison, the 1965 catch of sablefish by U.S. fishermen in Alaska was 2,311,000 pounds, and 1,000,000 pounds in 1967.

U.S. SURVEILLANCE AND INSPECTION

The first Japanese longliner was detected in the Gulf of Alaska in 1964 by a joint BCF-Coast Guard aerial patrol out of Kodiak. Since then, a special effort has been made to record the presence of these ships and, whenever possible, board and inspect them for the

Fig. 8 - A common modification of standard Japanese longliner in Alaskan waters is temporary shelter deck over main working deck. The 'Fukuyoshi Maru #15' was built in 1954. It is 297 gross tons, 135 feet long, powered by a 650 hp. slow-speed diesel, and carries 28 men. The gear is coming over starboard side. The butchering area is out of sight under shelter deck.

Fig. 9 - The 'Eikyu Maru #58' was built in 1967, primarily for the northern water longline fishery. Shelter over working area is permanent and part of original construction. Baiting and gear-setting areas are also enclosed in hull, rather than placed in temporary house on upper deck. The ship is 299 gross tons, 124 feet long, powered by a 700 hp. slow-speed diesel, and has crew of 28.

presence of halibut. Under the International North Pacific Fisheries Convention, parties to which are the U.S., Canada, and Japan, Japan has agreed to refrain from taking halibut of North American origin in the eastern North Pacific. The terms of the Convention authorize the inspection of the ships of one country by officials from another party when there is reasonable cause to suspect a violation.

Of the many Japanese longliners checked by BCF Agents in the Gulf of Alaska, only one vessel, the 'Eitan Maru,' has been found with halibut aboard. There is reason to believe these fish may have been taken in the Bering Sea.

LEGAL ASPECTS OF FISHERY

From the U.S. standpoint, a Japanese longline fishery in the Gulf of Alaska outside of the 12-mile contiguous fishery zone for species other than halibut (Hippoglossus stenolepis) or salmon (Oncorhynchus spp.) is legal. It is in accord with the provisions of the International Convention for the High Seas Fisheries of the North Pacific Ocean. However, because the Japanese gear used for sablefish and other demersal species in the Gulf is identical to that used for halibut, any such fishery is bound to be a matter of great concern to the U.S. A shift of only a few miles on the fishing grounds could change the Japanese take from almost 100 percent sablefish to nearly 100 percent halibut.

The Government of Japan, which issues licenses to its fishing vessels to fish in specific areas of the world's oceans, apparently did not issue any licenses for longliners in the Pacific east of long. 175° W. until September 1967. Therefore, by Japanese law, the vessels sighted from 1964 through September 1967 were fishing in the Gulf of Alaska illegally. It is known that in several instances, in 1964 and 1965, the Japanese Government took some punitive action against their longliners found fishing in the Gulf of Alaska.

The first full licensing year, 1968, saw 22 ships licensed by the Japanese Government to fish with longline gear for sablefish in the Gulf of Alaska. The Japanese Fisheries Agency operates patrol ships in the North Pacific. However, they seldom work as far east as the longline grounds in the Gulf. As far as is known, none of these ships patrolled the 7 major fishing grounds prior to 1968.

WHY DO TIDE RANGES IN THE SAME GEOGRAPHICAL AREAS OF THE WORLD DIFFER SO GREATLY?

In addition to effects of the moon and sun, tide ranges are affected by shape and dimension of the coastline and sea floor. In some restricted water areas (bays, channels, etc.), heights may build up to 50 feet and tidal currents of as much as 10 knots occur.

Tides moving upstream in an estuary are slowed down by bottom friction, and the following water piles up. The water rises more rapidly than it falls, and the flood stream has higher velocity than the ebb.

Some areas of great tidal ranges are the Bay of Fundy, Bristol Channel, and the Sea of Okhotsk. The famous Bay of Fundy tidal bore moves more than 100 billion tons of water a day.

There are also areas in the world that are almost tideless; among these are the Mediterranean, Baltic, and Adriatic Seas, and the Gulf of Mexico. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

LATE-WINTER WATERS OF YUCATAN STRAITS

A 1968 'Geronimo' Survey in Gulf of Mexico

Reed S. Armstrong

Oceanographic surveys in the Gulf of Mexico have demonstrated that the Yucatan Straits is the area where circulation dynamics are the most intense. For this reason, the water between the Florida Keys, Cuba, and the Yucatan Peninsula was selected for oceanographic investigations during the first manned Apollo spaceflight in 1968. While the spacecraft is operating its sensors, a BCF vessel will survey these waters on a "ground truth" mission. It is hoped this cooperative work will resolve numerous questions about the use of sensors aboard spacecraft to study the oceans.

Between Feb. 8 and March 5, 1968, cruise 20 of the R/V Geronimo (BCF, Galveston, Texas) was made in the Yucatan Straits area (fig. 1). The purposes were to: (1) determine if the survey area was large enough to cover the circulation patterns that might be detected by the Apollo spacecraft sensors--and if the station grid was adequate to bring out these features; and (2) examine the waters in this area of the Gulf of Mexico to establish how the deep water in the Caribbean flows over the relatively shallow sill (about 2,100 m. deep) of the Yucatan Straits.

What Scientists Did

During the cruise, 58 hydrographic stations were occupied to obtain information on temperature, salinity, dissolved oxygen, silicates, and phosphates from the surface to a maximum depth of 4,000 m. In the survey area, 113 bathythermograph casts were made and 34 more casts were made along the return track to Galveston. Additional work during this cruise, not expected to be conducted during the "ground truth" mission, included 96 phytoplankton and zooplankton hauls and 41 sediment grabs and bottom cores.

Temperatures during the cruise were about 25.5° C. or higher in the central part of the survey area but decreased to as low as 20.5° C. north of Campeche Shelf (fig. 2). Temperature on the shelf was about 22.5° C. In the northwestern Straits, the change in surface temperature was as large as 4° C. over a distance of about 56 km. In the central part of the Yucatan Straits, the occurrence of water of about 22.5° C. (surface temperature over the Campeche Shelf) at about 175-200 m. depth proves that upwelling had brought water from about that depth to the surface over the shelf.

Two Cruises Compared

Although reduction of the data has not been completed, the distributions of variables at the surface have indicated some interesting features, particularly when compared to the results of the 12th cruise of the Geronimo a year earlier (Feb. 20 to April 1, 1967). The water temperature was about 0.5° C. lower in the central Straits, and about 3° C. lower on the Campeche Shelf, than during the 1967 cruise. The cool surface water over the shelf north of the Yucatan Peninsula resulted from the upwelling of subsurface water because of the dynamic response to the strong northward current through the Straits.

The temperature differences were considerably greater over the Campeche Shelf than in the central portion during the two cruises. One or more of the following must have occurred: (1) the northward volume transport through the Yucatan Straits was greater in the winter of 1968 than in 1967, thereby causing deeper, colder water to be upwelled during 1968; (2) the northward flow in 1968 was restricted to a narrower width, so that if the volume transport was the same on both occasions, the main flow was confined to a narrow band of high-velocity current in 1968; (3) the core of the current in 1967 was in water so shallow that the bottom physically restricted upwelling; or (4) the winter of 1968 was more severe in the southeastern Gulf (and, therefore, in the northwestern Caribbean)

Mr. Armstrong is Research Oceanographer, BCF, Galveston, Texas 77550.
Note: Contribution No. 274.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 835

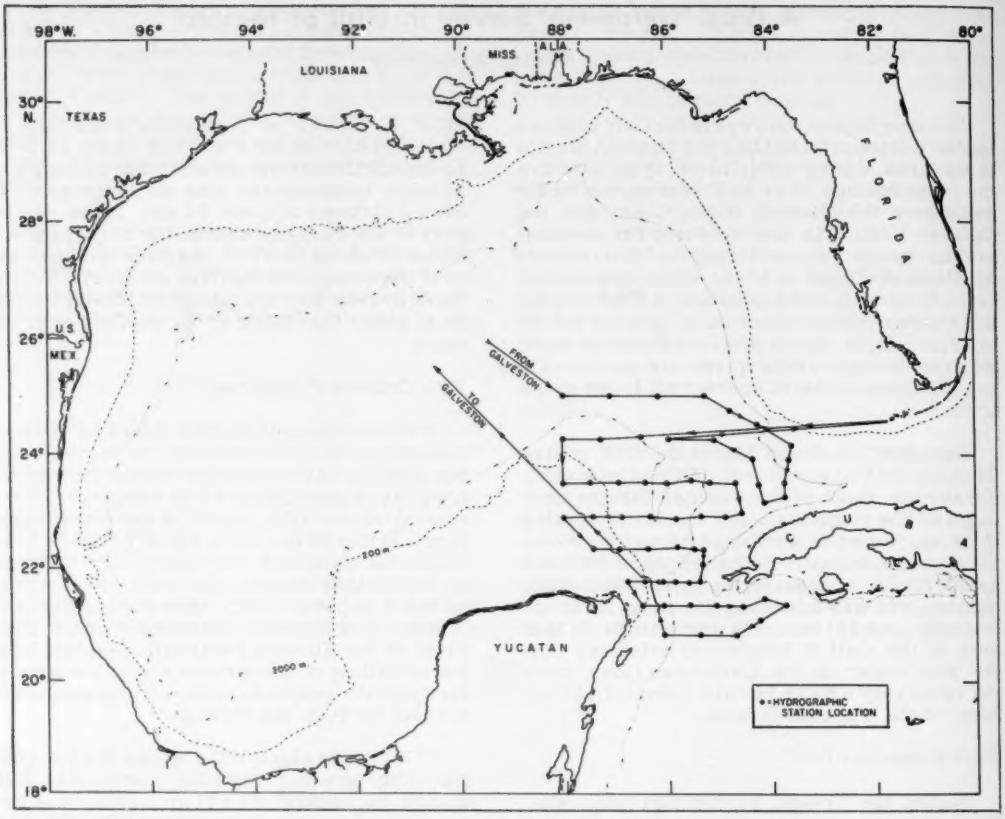


Fig. 1 - Cruise track and station plan for cruise 20 of R/V Geronimo to Yucatan Straits, Feb. 8-March 5, 1968.

than in 1967. To fulfill the last condition, the temperature differences between the two cruise periods would have to be about the same over the entire area, which definitely was not true. The third possibility also can be dropped from consideration because the current core was farther east, in deeper water, in 1967 than in 1968.

Surface salinities in 1968 were 35.8-35.9 p.p.t. (parts per thousand) over most of the central and eastern portion of the survey area--and increased westward to more than 36.5 p.p.t. over a distance of about 65 km. (fig. 3). Maximum surface salinities of about 36.8 p.p.t. were in a cell just north of the western tip of the Yucatan Peninsula. Compared to the surface salinities of the preceding winter, values were about 0.4 p.p.t. higher in the western sector over the shelf, and about 0.1 p.p.t. less over the remaining area. High values on the left-hand side of the northward current were a result of upwelling of deeper, high-salinity water (waters of these salinities were at a depth of about 175-200 m. in the central part of the Yucatan Straits).

The presence of cooler, more saline water over the Campeche Shelf in 1968 indicates that upwelling was more intense than in 1967. Not only was upwelling more intense--but the gradients of temperature and salinity were larger over the continental slope of the Yucatan Peninsula in 1968 than in 1967. Therefore, during winter 1968, the current velocity in the core of the northward flow was greater, and the maximum currents were restricted to a narrower band than during the 1967 cruise.

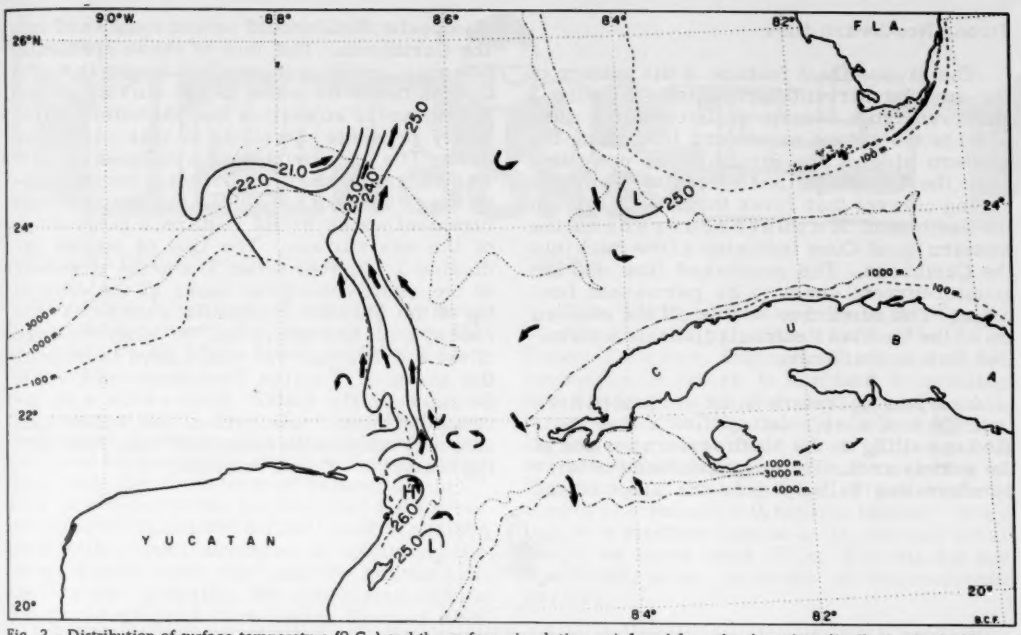


Fig. 2 - Distribution of surface temperature (° C.) and the surface circulation as inferred from the density distribution in the Yucatan Straits and the southern portion of the Gulf of Mexico.

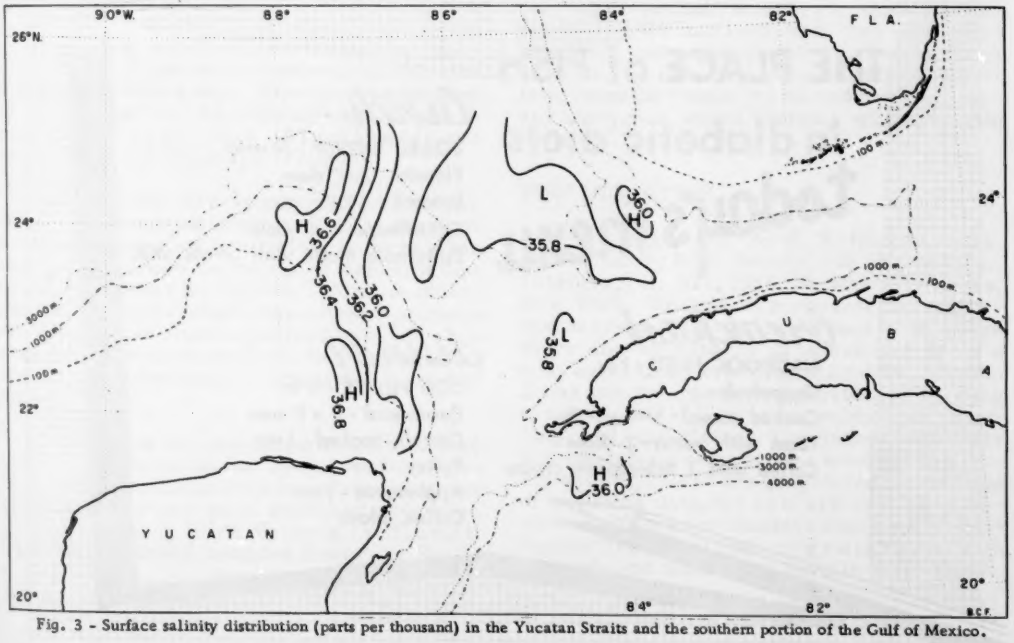
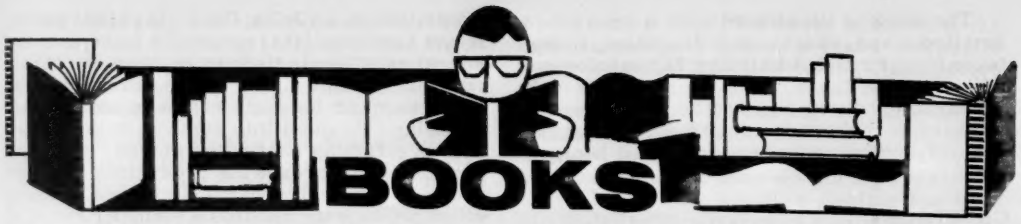


Fig. 3 - Surface salinity distribution (parts per thousand) in the Yucatan Straits and the southern portion of the Gulf of Mexico.

Strong Northward Flow

The predominant feature of the pattern of the surface currents presented in figure 2 (inferred from density distribution at surface) is the strong northward flow along the western side of the Straits. The upwelling over the Campeche Shelf results from this strong current that flows into the Gulf from the Caribbean. A countercurrent off the western tip of Cuba indicates a flow back into the Caribbean. The northward flow and the countercurrent seem to be permanent features. The numerous eddies off the eastern tip of the Yucatan Peninsula indicate a turbulent flow in that area.

A surprising feature in the current pattern is the lack of a well-defined flow and associated upwelling in the southwestern portion of the survey area. The large gradients of temperature and salinity over the slope of the Campeche Shelf should extend southward into the Caribbean. The lack of these gradients, however, probably means that the depth to the bottom below the core of the current and shoreward is so shallow that the bottom physically prevents upwelling in that particular area. The area must be in a turbulent condition that might erode the bottom. Because upwelling could not occur, the dynamics of this turbulent water would require a large slope of the sea surface. The line of eddies indicated in figures 2 and 3, and the presence of the shallow shelf and banks off the western tip of the Yucatan Peninsula, support this concept. If this appraisal is valid, the core of the surface current would have to be near the shore of Yucatan Peninsula--and would be increasingly distant from shore with increasing depth. Analysis of the subsurface data may resolve the question of this interesting feature of the circulation.



UNDERWATER EXPLORATION

'Undersea Frontiers--Exploring by Deep Diving Submarines,' by Gardner Soule, 253 pp., illus., $6.95, 1968. Rand McNally & Co., New York.

"Today a small group of men are exploring landscapes stranger than the surface of the moon and encountering creatures more startling than the monsters of science fiction." This is a book for the commercial fisherman who has everything but a first-hand acquaintance with recent advances in exploring the ocean depths--and who may be unaware of their great potential for supplying man's present as well as future needs. Much of what is recounted was gleaned personally by the author from actual participants in these illuminating investigations.

The latest developments in design, construction, and operation of submarine vehicles are discussed in detail. The success stories of these vehicles--24 of them--are ranged in alphabetical order from 'Aluminaut' and 'Alvin' to the bathyscape 'Trieste.'

The accounts are accompanied by timely information especially interesting to physical oceanographers and geologists looking for mineral outcrops or bottom deposits that might profitably be "mined." Marine biologists will be interested in the notes on animals observed in the course of dives and deep-sea cruises. These range from fish to jellyfish, and include planktonic organisms, plant and animal.

The book is an encyclopedic review of undersea exploration that can be read by specialists and their families for information and entertainment--or as a series of adventure stories rivaling Jules Verne's fictional "Twenty Thousand Leagues Under the Sea."

--W. L. Schmitt

FISHES

'The World of Fishes,' by Brian Vesey-FitzGerald, 128 pp., illus., 1968. Pelham Books, London, England. For most of us, knowledge of fishes is confined to catching and eating them. But angling has a much larger and infinitely more dedicated following than any other field sport. This book is not concerned, however, with the catching of fish nor with cooking them. The fishes occupy a special place in natural history. They live in a medium hostile to us, and one about which we know very little. For all but the specialist, water provides an impenetrable barrier.

Mr. Vesey-FitzGerald explains how fish adapt to life in a strange world of widely varying pressures; how they breathe and reproduce, grow and feed; how they find their way about, making migrations as vast as those of birds. This book, not intended for specialists, takes the reader on an underwater journey through a world teeming with fantastic forms of life.

FISH MIGRATION

'Fish Migration,' by F. R. Harden Jones, illustrated by H. E. Jenner, 325 pp., 86 figs., 38 tables, ref., $21, 1968. St. Martin's Press, New York. No general account of fish migration has been published in the English language since the appearance of Alexander Meek's book in 1916. In 'Fish Migration,' Dr. Harden Jones has summarized the evidence relating to homing and migration in salmon, eel, herring, cod, and plaice. The sensory channels and behavioral mechanisms involved in homing and migration are considered in the light of available data, which are critically reviewed. There are chapters dealing with biological aspects of fish migration and with methods and techniques used in their study.

The work is illustrated with numerous detailed maps, charts, and diagrams, many taken from British Admiralty, Meteorological Office, or Ordinance Survey maps. It will appeal to graduate students and research workers in universities and institutions of zoology, hydrography, and marine biology throughout the world.

CRUSTACEA

'Aspects of the Physiology of Crustacea,' by A. P. M. Lockwood, 328 pp., illus., 1967. W. H. Freeman & Co., San Francisco, Calif.

The crustacea have always been a popular group for physiological research because they show such diversity in body form and mode of life. To the practical researcher, they are particularly attractive because many of the more readily obtainable species are amenable to laboratory rearing and, as a rule, tolerate experimental conditions very well.

This is a concise book suitable as a textbook for senior undergraduates and as background reading for postgraduates. In neither group do potential readers usually have much time to devote to a single topic. The book provides an outline of the physiology of the crustacea which can be read at a few sittings and yet give an overall appreciation of the subject. The coverage is general, but special attention has been given to those aspects where the physiology differs from that of other animal groups.

SEASHELLS

'British Bivalve Seashells,' by Norman Tebble, 212 pp., illus., $3.50, 1966. British Museum, London, England. This handbook describes and illustrates the shells of bivalve molluscs living in the seas around the British Isles. It should be of use to anyone beginning a study of seashells or marine life--the experienced amateur conchologist and the professional zoologist.

TUNA

'Distribution of Skipjack in the Pacific Ocean, Based on Records of Incidental Catches by the Japanese Longline Tuna Fishery,' by Makoto Peter Miyake, Bulletin No. 7, Vol. 12, in English and Spanish, pp. 511-608, $1, 1968. Inter-American Tropical Tuna Commission, La Jolla, Calif. In recent years, it has been found that some tuna fisheries are operating at levels close to, or over, the maximum sustainable catch. At the same time, the world demand for tuna has been steadily increasing. To meet this demand, without further overfishing particular stocks, it will be necessary to increase the production of other species, and to try harvesting tuna at sizes which produce the maximum yield per recruit.

The skipjack, Katsuwonus pelamis, appears to be a species that has not been fully exploited. Extensive surface fisheries exist for it along the coast of the Americas and in waters east and south of Japan. Since skipjack fisheries have been limited thus far to waters relatively close to shore, information on distribution is limited also. The Japanese longline fishery covers almost the entire Pacific, but very few skipjack are caught compared with other species.

All available longline data on skipjack captures in the Pacific by Japanese research vessels (1959-1965), and from incidental skipjack catches by Japanese commercial vessels (1956-1964), are analyzed.

"Early Life History and Spawning of the Albacore, Thunnus alalunga, in Hawaiian Waters," by Howard O. Yoshida, Fishery Bulletin, Vol. 67, No. 2, pp. 205-211, 1968. Fish and Wildlife Service, Dept. of the Interior. Available from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

The albacore in the North Pacific are believed to constitute a single subpopulation, the adults of which support fisheries off the coasts of north America and Japan. The age and growth of adult albacore have been estimated and hypotheses have been developed on their migrations among the fisheries. However, basic information on young albacore before they are recruited into the commercial fisheries is sketchy.

This report treats aspects of the early life history of albacore before their recruitment into the commercial fisheries. Growth in the first year of life is estimated, and inferences are made about the spawning habits of the adults. The juvenile albacore for this study came from the stomachs of billfishes, good collectors of tuna.

The following articles appear in Fishery Bulletin, Vol. 67, No. 1, 1968, Fish and Wildlife Service, Dept. of the Interior. Available from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209:

'Distribution, Apparent Abundance, and Size Composition of Albacore (Thunnus alalunga) taken in the Longline Fishery Based in American Samoa, 1954-65,' by Tamio Otsu, and Ray F. Sumida, pp. 47-69, illus. Before World War II there was almost no longline fishing for tuna in the South Pacific. The fishery began in 1954, when tuna canning began in Pago Pago, American Samoa, with fish delivered by 7 Japanese longliners. A second cannery opened in 1963. By 1965, a 105-vessel fleet was covering about 23 million square kilometers in the central and eastern South Pacific. This paper describes the fishery, gives biological data (size and sex) on albacore, and presents results of some preliminary analyses of the catch rates of albacore as a measure of apparent abundance.

'Micronekton of the Eastern Tropical Pacific Ocean: Family Composition, Distribution, Abundance, and Relations to Tuna,' by Maurice Blackburn, pp. 71-115. To the extent that net hauls sample kinds of micronekton that are important as food for tunas, they can be used to compare quantities of tuna prey in different areas. Because tunas feed on micronekton, a knowledge of its distribution might help to explain the tunas' variable distribution in the eastern tropical Pacific. Comparison of net-caught and tuna-caught micronekton (from tuna stomachs) might be of value in the study of feeding behavior of tunas. Food-chain relations in the ocean have had much physiological and statistical study between the producer and herbivore levels, but comparatively little study has been made between those levels and the carnivore levels. This paper summarizes most of the micronekton data obtained before 1964 in the eastern tropical Pacific and analyzes them in reference to distribution and relation to contents of tuna stomachs.

SALMON

'Spawning Areas and Abundance of Chinook Salmon (Oncorhynchus tshawytscha) in the Columbia River Basin--Past and Present,' by Leonard A. Fulton, SSR-F No. 571, 26 pp., 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

Chinook salmon formerly spawned in the main stream and in nearly every accessible tributary of the Columbia River. This species is the most important of the area in total population, poundage harvested, and in value to commercial and sport fisheries. The catch declined from 19.5 million kilograms (kg.) in 1883 to an annual average during 1962-66 of about 2.3 million kg. The decline has been attributed to the advance of civilization in the Pacific Northwest. Irrigation, logging, mining, dam construction, and other activities reduced the size and capacity of spawning areas. Resolution of the problems of safely passing migrating salmonids--particularly young downstream migrants--has not kept pace with dam construction in the Columbia River drainage.

To plan research effectively, and to aid management of the remaining runs of Columbia River chinook salmon, it was necessary to review the many reports available on spawning of salmonids. There is a need for published summaries that are comprehensive and cover the entire Columbia River basin. This report on chinook salmon is intended to fill that need.

FISH PASSAGE

'Diel Movement and Vertical Distribution of Juvenile Anadromous Fish in Turbine Intakes,' by Clifford W. Long, Fishery Bulletin, Vol. 66, No. 3, pp. 599-609, 1968. Fish and Wildlife Service, Dept. of the Interior.

The behavior of fingerling salmonids in turbine intakes, including their time of passage and distribution in the water mass, can profoundly influence development of efficient and economical methods for reducing fish mortality in turbines. The need for fish protection at dams is becoming particularly acute in the Columbia Basin because the progeny of upriver stocks of salmonids soon will be forced to pass through the turbines of 8 to 10 dams to reach the sea.

This paper reports on experiments at two dams on the Columbia River to acquire data on timing and distribution of fingerling salmonids entering turbine intakes.

GREAT LAKES

'Plankton Studies in the Largest Great Lakes of the World,' by Charles C. Davis, and 'A Review of Great Lakes Benthos Research,' by E. Bennette Henson, Publication No. 14, 54 pp., illus., 1966. Great Lakes Research Division, Univ. of Michigan, Ann Arbor.

Biological investigation of the St. Lawrence Great Lakes began about 1890 and has continued at an increasing rate, with a distinct upsurge in the past decade. This upsurge is due to a national and regional interest in the lakes as a water resource. It is a resource of such importance that a management program must be effected. Published results of the numerous studies on the lakes are scattered through government reports, scientific journals, notes from industry, sports magazines, and special publications. Drs. Charles Davis and E. Bennette Henson have written these papers in an attempt to review the work in the areas of benthos and plankton, and to compile a complete bibliography.

ALASKA

'A Limnological Reconnaissance in Interior Alaska,' by Gene E. Likens and Philip L. Johnson, Research Report 239, 45 pp., illus., 1968. U. S. Army Materiel Command, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

The aquatic environments in arctic and subarctic areas are, for the most part, little known. Numerous data are available on the quantity and chemical quality of river waters in Alaska, but relatively little is known about their biological and physical factors. Very little limnological information is available on the abundant lake habitats. Furthermore, few data are available on the interaction of organisms and these aquatic environments. Yet these ecological features seem to be very important to man's consideration of future use and development of the cold regions.

The physical, chemical, and biological features of river and lake waters are important with regard to sources of potable water, transportation, and industrial development. Understanding these features is also basic to understanding organic production and food supply. A reconnaissance to obtain information about various aquatic habitats in Alaska, particularly lakes, was begun in 1964 and continued in 1965. This report concerns the information gathered on about 40 lakes and other aquatic environments.

'Oceanographic Surveys of Traitors Cove, Revillagigedo Island, Alaska,' by Douglas R. McLain, SSR-F No. 576, 15 pp., illus., 1968. Fish and Wildlife Service, Dept. of the Interior. Available from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

Pink salmon (Oncorhynchus gorbuscha) and chum salmon (O. keta) spawn in the gravels of many of the streams of southeastern Alaska. In the spring, the juvenile fish emerge from the gravel and soon migrate downstream to salt water. Their first few weeks in salt water are a critical period in their life cycles. Probably a large portion of the total ocean mortality of these fish takes place during this period.

Relatively little is known of the oceanography of the salt-water areas in southeastern Alaska, where this mortality occurs. The paper describes a study of water temperature, chemistry, and surface currents of such an area--Traitors Cove, a small fiordlike estuary near Ketchikan, in southeastern Alaska.

FISH DISEASES

'Diseases of Fishes,' by C. van Duijn, Jr., 2nd edition, 309 pp., illus., $9.50, 1967. Charles C. Thomas, Springfield, Ill. The new edition of this book dealing with the identification and treatment of fish diseases has been updated and expanded to include new knowledge about therapy and drugs. The 1956 edition was intended for aquarists and pondkeepers. It met with such enthusiasm and approval from professional fish breeders that this new edition includes even more information regarding diseases of economic importance.

MARINE MICROORGANISMS

'Microbial Population of Oceans and Seas,' by A. E. Kriss, I. E. Mishustina, I. N. Mitskevich, and E. V. Zemtsova, edited by Gordon E. Fogg, translated by K. Syers, 287 pp., maps, $16.50, 1967. St. Martin's Press, New York. This survey of the distribution of marine microorganisms could be a starting point for much future investigation into the occurrence and activities of microorganisms responsible for the chemical and biological processes which take place in the ocean.

--Barbara Lundy

INTERNATIONAL

Swedish FPC Used in Biafra

By late November 1968, initial field tests of fish protein concentrate (FPC) in Biafra had produced very satisfactory results. Only half of the 20-metric-ton order had been sent by the Swedish producer ASTRA, but the remainder was scheduled for early delivery.

Tested on Children

Most of the FPC was distributed by the Lutheran Aid Society. However, the Swedish Red Cross distributed half a metric ton to be used under controlled conditions at a field hospital. Two hundred children suffering from protein deficiency were given FPC, and 260 were given protein in the form of milk. Ninety-five percent of the children receiving milk protein suffered from diarrhea and recovered more slowly. No diarrhea appeared in those receiving FPC and, on the average, they recovered 30% faster. The children in both groups were between 1 and 5 years old. They were given the protein supplements together with carbohydrates from indigenous root foods.

Unflavored FPC Favored

It may be desirable to have the FPC in a pure unflavored form, rather than chocolate-flavored, as the initial shipment was. Pure FPC would be easier to use in the field because it could be mixed directly with local root foods.

First Use By People

The FPC distribution in Biafra was the first significant use of Swedish FPC for human consumption. Previous supplies of FPC from ASTRA have been used as a protein additive in livestock feed. (U.S. Embassy, Stockholm, Nov. 26, 1968.)

France & U.S. Will Cooperate in Oceanography

The U.S. and France have agreed to cooperate informally in oceanographic work. The two countries will promote direct contacts between U.S. and French specialists--and annual meetings between the U.S. Marine Council and CNEXO (French National Center for Exploitation of Oceans).

Some possible areas of cooperation include fish protein concentrate (FPC), ocean pollution, research personnel training, and technology of deep diving.

Lucien Laubier, Deputy Director of the Banyuls Laboratory, will be the French contact for the FPC phase of the program. His U.S. counterpart will be H.E. Crowther, Director of BCF. (U.S. Dept. of State, Nov. 9, 1968.)

Shipping Exhibition Scheduled for Greece

An international shipping exhibition, 'Posidonia '69,' will be held in Athens, Greece, June 2-8, 1969. 'Posidonia '69' will set a completely new trend in international shipping exhibitions.

It will be the first international exhibition of its type aimed specifically at the Greek shipping market. Exhibitors will receive free marketing and other expert advice before, during, and after the event. The exhibition will be open evenings only.

Most Space Already Taken

Most of the available stand space has already been filled. Britain, the Netherlands, Italy, West Germany, Norway, Japan, Switzerland, and Greece are taking part. They may be joined by exhibitors from the U.S., Denmark, France, and Spain.

Shipbuilding, ship repairing, marine engineering, all types of equipment, shipbrokering, bunkering, insurance, and banking will be represented.

'Posidonia '69' will give the worldwide marine industry an opportunity to show its wares on the doorstep of the world's second largest shipping market. ("Alieia.")

Conference Slated on Fish Inspection and Quality Control

An FAO-sponsored International Technical Conference on Fish Inspection and Quality Control is to be held in Halifax, N.S., July 15-25, 1969. As many as 300 delegates and observers from 40 countries are expected.

Conference arrangements grew out of the work of the Codex Alimentarius Commission, a joint FAO-World Health Organization body established to formulate international quality standards for food products. Standards for several fishery products should be available in a few years; inspection systems are considered necessary to ensure compliance.

Proposed in 1964

In 1964, the Committee of Experts on International Standards for Fish and Fishery Products recommended an international conference to exchange technical information among technologists, industrialists, and research workers.

The Halifax conference should foster an understanding of fish-inspection principles and general agreement on the most effective inspection techniques. (Canadian Dept. of Fisheries.)

Japanese Tuna Seining Off Africa Slow

In November 1968, 7 Japanese purse-seine units fishing in the eastern Atlantic off west Africa landed about 2,000 tons of tuna, mostly skipjack. Fishing is steadily falling off and no information has been released on fleet operations during the slow fishing season. ("Katsuo-maguro Tsushin," Dec. 13, 1968.)

Japanese Tuna Fishing Off Chile Poor

In Dec. 1968, the exploratory long-liner 'Azuma Maru No. 31' (340 gross tons), seeking new tuna grounds off central Chile, reported poor fishing. Catches averaged 0.5 ton per operation. No bluefin tuna were found. By Dec. 5, 1968, vessel's catch since survey began in late May 1968 was 203 tons--67% big-eyed, 18% albacore, and 15% unclassified. ("Katsuo-maguro Tsushin," Dec. 16, 1968.)

Japan-Mauritania Fishery Talks Break Off

Private negotiations between Japan and Mauritania in progress at Port Etienne since Dec. 5, 1968, to allow Japanese vessels to fish inside Mauritania's 12-mile exclusive fishery zone, were suddenly terminated Dec. 10. Conditions set by Mauritania were unacceptable to Japan. These negotiations followed up earlier talks held in Tokyo, where the Mauritanians had shown considerable flexibility.

Japanese Proposals

The Japanese negotiators were seeking Mauritania's permission for Japanese trawlers to fish inside Mauritanian-claimed waters on payment of an entry fee. Also under discussion were extension by Japan of close to US$278,000 annually in fishery cooperation funds, and arrangements to buy Mauritania's fish.

The Japanese had hoped to reach an agreement enabling 69 Japanese trawlers, operating off west Africa, to fish for octopus in Mauritanian waters in 1969, during the peak season from January to April. ("Suisan Keizai Shimbun," Dec. 16, and "Suisan Tsushin," Dec. 7, 1968.)

El Salvador to Get South Korean Study Team

South Korea planned to send a 3-man fishery study team to El Salvador in late January 1969. Purpose of the month-long visit was to study the possibilities of developing El Salvador's fisheries. Two weeks will be spent in field surveys, one week reviewing the field work, and one week preparing a report.

S. Korean Plans

If all goes well, South Korean boats will operate from El Salvador ports, principally for tuna, and possibly for shrimp and other species. The Koreans will train 2 or 3 El Salvador fishermen/operators, probably at the FAO deep-sea fishery training center in Pusan, South Korea. (U.S. Embassy, Tokyo, Jan. 7, 1969.)

Norwegian-USSR Sealing Commission Meets

The 11th Session of the Norwegian-Soviet Sealing Commission was held in Moscow Dec. 11-13, 1968. It was attended by scientists and fishery administrators from both countries. Seal catches of the two nations in 1968 and plans for 1969 scientific investigations on the sealing stock in the Northeast Atlantic were discussed.

According to the Norwegian press, the Soviet Commissioners expressed a wish for further Norwegian measures to limit seal catches. The Norwegian Commissioners, however, considered their current measures sufficient to preserve the seal stocks.

1968 Catches

Norway has shortened the seal-hunting season. Her participation in Northeast Atlantic sealing is limited to vessels of less than 100 gross registered tons. In 1968, Norwegians caught 15,000 seals with 5 vessels. Soviet seal hunting, which is land-based, is limited to an annual catch of 20,000 animals.

The 12th session of the Commission will be in Oslo in November or December 1969. (U.S. Embassy, Oslo, Dec. 24, 1968.)

USSR & Iceland Renew Trade Agreement

The Soviet-Icelandic trade agreement, scheduled to expire at the end of 1968, was renewed for 3 years (1969-1971) in late August 1968. The agreement covers Soviet exports to Iceland of petroleum products, machinery, and equipment (fish processing machinery, ships and ship equipment, etc.); and Icelandic exports to the Soviet Union of frozen fish, salted and frozen herring, canned or preserved fishery products, fishing gear, etc.

New Import Quotas

A minimum and maximum annual quota range of 4,000-6,000 metric tons for Icelandic exports of whole frozen fish and frozen herring was established under the new agreement. This gives the Soviets greater flexibility in annual purchases than the expired agreement, which provided for an annual 5,000 ton purchase of those items.

The Soviet annual import quota for frozen fish fillets remained unchanged at 12,000-15,000 tons; salted herring quota is 10,000-12,000 (3,000 tons less than under the expired agreement); quota for canned or preserved fishery products ranges from 31.5 to 50 million kroner (US$552,600-877,000).

Some Quotas Not Set

Fixed annual quotas have not been established for Soviet imports of Icelandic fish nets, lines and ropes, nor for Icelandic imports of Soviet fish processing machinery, ships and ship equipment. (U.S. Embassy, Reykjavik, Sept. 5, 1968.)

Note: It is not known if any arrangements were made with regard to the agreement after Iceland's kroner devaluation on Nov. 12, 1968. Therefore, the old conversion rate of 56.93 kroner to US$1 has been used.

FOREIGN

CANADA

NEWFOUNDLAND WILL BUY FISH PLANTS

The Newfoundland Government will purchase the facilities of North Eastern Fish Industries, Ltd. (NEFI) to prevent their close-down when Unilever, Ltd., ceases operation at the end of January 1969. The province will buy 4 processing plants: one each at Harbour Grace, Old Perlican, Fermeuse, and Port-de-Grace; the fish-meal plant associated with the Harbour Grace facility; 4 working deep-sea draggers and a training ship; and 18 homes built for NEFI personnel. The estimated value is C$12 million. No indication was given of the funds' source. At full production, the plants employ about 800 persons and purchase fish from 1,200 inshore fishermen.

Why Industry Is Slipping

The Government will keep the plants going until a private operator is found. The fish processors claim that foreign subsidies are responsible for the low prices paid for Newfoundland fish in the U.S. market. Other observers contend that conditions in the local industry explain the Europeans' success at Newfoundland's expense. These conditions include: outdated fishing methods and equipment, undersized catch, inferior product, and operating methods unsuited to local conditions, particularly by British parent firms such as Unilever and the Ross Group. (U.S. Consul, St. John's, Dec. 19, 1968.)

* * *

NEWFOUNDLAND SHRIMP

Ever since the Canadian Department of Fisheries began to explore the possibilities of shrimp fisheries along Newfoundland's west coast, rumors have been circulating that it was a large untapped resource. It now appears that the number of shrimp available is relatively small; only supervised commercial exploitation can determine what amount of harvesting the resource can carry. Local fisheries officials do not believe the resource can stand any large-scale commercial exploitation.

Location of Shrimp

Initially, it was thought that shrimp were available only in the area immediately adjacent to Point Riche. New explorations have indicated a considerable quantity of relatively small shrimp available south from Point Riche to Cow Head. A slightly larger variety is found on the south coast east of Ramea, and in St. Mary's Bay.

Lack of Processing Plant

The Canadian Department of Fisheries will continue exploratory work for the next 3 to 4 years. However, it is looking to commercial fishermen to determine by actual trawling the extent to which shrimp can be harvested, particularly along the west coast. One problem is the area's lack of adequate canning or freezing facilities. With a plant available, unshelled shrimp could be frozen and shipped directly. Until one is built there will be no market for commercial exploitation, except for local fresh product sales.

Dangers of Exploitation

Fisheries officials are extremely cautious in discussing shellfish exploitation in Newfoundland because of the recent overexploitation of scallops. They also fear for the lobster harvest as there is constant danger that overeager fishermen will harvest the female before she can lay her eggs. So Department scientists are keeping close watch on all harvesting of shellfish off the coast of Newfoundland. (U.S. Consul, St. John's, Nov. 21, 1968.)

* * *

NEWFOUNDLAND FISH-MEAL PLANT REBUILT

International Fisheries and Fish Meal, Ltd., plans to reopen a fish-meal plant at Port Harmon, Newfoundland, soon. The plant was almost destroyed by fire early in 1968. International Fisheries is a subsidiary of Litton-Grace Industries.

The plant will employ 30 people and provide markets for the local herring fishermen. A small net-repair operation associated with

Canada (Contd.):

the plant has been supplying trawlers based in the area. (U.S. Consul, St. John's, Oct. 30, 1968.)

* * *

CHANGE SALMON LICENSING PROGRAM

The privilege of fishing salmon will be given to all west coast commercial fishing vessels that had recorded landings of any species in 1967 or before September 6, 1968. This extends the salmon license program effected in fall 1968, and allows halibut, herring, groundfish, and shellfish boat owners to fish for salmon. They have until May 31, 1969 to decide.

Salmon Fleet

There are now 7,000 Class 'A' and 'B' salmon boats, a reduction of 1,200 since the salmon restriction license scheme went into effect September 6, 1968. Another category has been added, Class 'C', for boats not wishing to fish salmon. A maximum of about 160 boats, excluded from the initial salmon program, will be affected under this plan if all choose to come in. About 65 halibut boats, 40 that fish for groundfish, 25 shellfish boats, and 30 other type boats will now be able to fish salmon. Boats that come into this scheme will be under the same restrictions announced for salmon boats in September 1968. ("Fisheries News," Nov. 21, 1968.)

* * *

TO CONVERT RETIRED WEATHER SHIPS TO FPC FACTORY SHIPS

A Vancouver, B.C., firm has purchased 2 surplus weather ships for conversion to FPC factory ships. They will be used on the east and west coasts of Canada. Each ship, trawling for about 200 tons of hake, turbot, herring, dogfish, and perch a day, will convert the catch to 40 tons of powdered FPC and 8 tons of oil.

Target Date: July 1969

The company will operate under a U.S. firm's license. It will hold 7 Canadian patents for the azeotropic solvent extraction process. Communist China may purchase the entire west coast output. First conversion on the west coast should be completed by July 1969. About 28 men will be required for navigation and fishing, and 6 to man 3 shifts in the factory area. ("Fishing News International," Dec. 1968.)

* * *

ARTIFICIAL CULTCH DEVELOPED FOR OYSTERS

An artificial cultch, developed by the British Columbia Research Council, is said to have many advantages over the mature oyster shells commonly used in oyster farming. The cultch is being tested in Pendrell Sound.

During commercial transplanting of oysters to new beds, the very young oysters are collected in the water on cultch, a solid material, mainly mature oyster shells.

Advantages of New Cultch

The new artificial cultch is uniform in size and shape, permitting convenient packing, and is shaped to minimize silting of surfaces by bottom mud. As it disintegrates in sea water after about a year, individual oysters on the same piece of cultch do not crowd and compete with each other.

* * *

MIDWATER HERRING TRAWLING SUCCESSFUL

Huge midwater trawl catches of Atlantic herring in the Gulf of St. Lawrence have shown that trials of this method, pioneered by the Departments of Fisheries of Canada and Nova Scotia, have proved successful. A record 1,200-ton catch was made early in November 1968, by the 'J.B. Nickerson,' a 156-foot stern ramp trawler. It showed the method, previously proved feasible with smaller vessels, can be adopted by larger trawlers. J.B. Nickerson is the first of her size to try midwater trawling for herring.

Nickerson Catches

On November 2, 1968, the J.B. Nickerson landed 428 tons of herring. Four days later, she arrived in port with 499 tons and, on November 9, brought in another 300. The 300-ton catch, made in a single night, would have been greater, but bad weather put a stop to fishing. All catches were made at night in the Bird Rock area off the Magdalen Islands. Catches were landed at Caraquet, N.B., for fish meal production. (Canadian Dept. of Fisheries, Nov. 20, 1968.)

EUROPE

Norway

TROUT ARE RAISED IN SEA WATER

A new method of raising trout has been developed in the Sunnmøre district of Norway in the past decade. Instead of keeping the fish in fresh-water tanks and pools, they are reared in sea water rich in the natural nutriment enjoyed by sea trout and salmon. In this way, qualities of pigment, aroma, and taste are achieved that are superior to those of trout raised in fresh water.

The fish are almost all rainbow trout, a particularly adaptable variety. Like salmon, rainbow trout are spawned in fresh water but grow and flourish most noticeably in sea water. They thrive particularly well in the temperate waters of the Gulf Stream zone along the Norwegian west coast.

Co-op Formed

Sunnmøre is the geographical center of the district of the same name. In Sunnmøre's main town, Alesund, the trout farmers have established a cooperative, Norsk Ørretomsetning S/L. Export inquiries are handled by Ferskfiskutvalget, Alesund.

The so-called salmon trout of Sunnmøre differs considerably from ordinary rainbow trout. This is due particularly to the salmon-red coloring of the meat and its taste and texture. Especially when smoked, it can be mistaken for salmon; however, the salmon trout contains fewer calories and is less fatty than salmon.

Output Still Small

Output is modest. Exports have been chiefly to Sweden, where there is a heavy demand for the salmon trout. Production is being increased gradually to satisfy markets in other countries.

Price is higher than for rainbow trout but lower than for salmon. ("Norway Exports.")

* * *

DEVELOPS MACHINE FOR BAITING LONG LINES

A Norwegian firm, Trio Maskinindustri, has developed a machine for baiting long lines. It will bait 2 hooks a second while the vessel maintains a speed of 6 m.p.h. Hooks, on dropper lines one fathom long, are baited with herring. If tests are satisfactory, the machine will be produced to sell for US$1,060 to $1,450. (Reg. Fish. Attaché, U.S. Embassy, Copenhagen.)

Denmark

LANDS LARGE REFRIGERATED SEA WATER-PRESERVED CATCH

In mid-November 1968, the Faroese power-block purse seiner 'Solborg' landed the largest catch of fish ever brought by a single vessel into the North Sea port of Hirtshals, Denmark. The catch, 260 metric tons of mackerel, preserved in Solborg's refrigerated sea water (RSW) tanks, was expected to be worth about US$26,600.

RSW-preservation has been hailed as a giant step forward for the Danish fishing industry. The Dutch have offered sharp competition in supplying herring and mackerel to the big West German canning industry. (U.S. Embassy, Copenhagen, Nov. 26, 1968.)

* * *

FAROESE MAY PUSH FOR 16-MILE FISHING LIMIT

The Faroese fishermen's association favors extending the present 12-mile fishing limit to 16. Faroese say that stocks of cod and haddock inside the limit have increased greatly since it was set at 12 miles and foreign fishermen were excluded. No official comment has yet been made on fishermen's demand.

EFTA Responsibilities

As EFTA members, they would be prevented from extending the limits. They had

Denmark (Contd.):

joined EFTA primarily to avoid British customs duty on frozen fillets. Now that Britain has extended the duty to EFTA countries, there is no reason for the Faroe Islands to continue as members. In fact, a bill has been introduced in parliament to withdraw from EFTA. (Asst. Reg. Fish. Attaché, U.S. Embassy, Copenhagen, Nov. 26, 1968.)

* * *

FAROESE RECEIVE FIRST FACTORY TRAWLER

The 'Stella Kristina,' the first Faroese factory stern trawler, was built in Norway. It is 203 feet long, has a beam of 33 feet, and is powered by a 2,200-hp. diesel. The vessel can produce 36 tons of frozen fillets in 24 hours and can carry 700 tons in her cold-storage holds. Both bottom and midwater trawls can be operated using 8 remote control winches on the trawl deck. Fish are gutted by hand, but all other operations are by machine. Conveyer systems are used for all transport until the frozen fillets are placed in cold storage.

Modern Equipment

Stella Kristina is equipped with modern fish-finding and navigating equipment, including echo-sounder, ASDIC, netsonde, and a 1,200-watt transmitter. The factory deck has 2 fillet lines, one each for small and large fish. Fillets are collected in the center and packed in 5.5-lb. cartons for the 3 freezer units; each unit can handle 12 tons in 24 hours. After freezing, fillets are removed from the small cartons and repacked in larger boxes before being carried by conveyer to the cold-storage hold.

Sistership

A sistership to Stella Kristina will be delivered in April 1969. There are plans to order a third, and perhaps a fourth, vessel in the series. (U.S. Embassy, Copenhagen, Dec. 30, 1968.)

* * *

INDUSTRIAL FISHERY IN ESBJERG BOOMING

During the first 10 months of 1968, industrial fishery landings in Esbjerg exceeded 500,000 metric tons. This is considered fantastic by local experts, who had predicted earlier that landings might reach this level by 1980. About 325,000 tons were landed in same period 1967. Reasons for increase include excellent weather in 1968 and great abundance of North Sea stocks of industrial species.

Co-op Busy

At Esbjerg's largest fish meal and oil cooperative, spokesmen noted that landings from their 330 member vessels had exceeded predicted landings by 100,000 tons. The plant has been able to process 1,200-1,300 tons of fish a day throughout the entire year without difficulty. However, experts warn against counting on such landings in future years. (U.S. Embassy, Copenhagen, Nov. 26, 1968.)

France

BRITTANY TO ESTABLISH SINGLE FISHING POLICY

A single fishing policy is to be established by 14 ports in Brittany to combat generally deteriorating conditions in the area. The ports are Morgat, Douarnenez, Audierne, St. Guenole, Kerity, Guilvienec, Lesconil, Loctudy, Concarneau, Moelan, Lorient, Etel, Camret, and Quiberon. Lorient, Concarneau, and Douarnenez are the 2nd, 3rd, and 5th largest ports in France, producing about 15% of the national catch.

In 1968, these ports suffered from low prices and small catches. Lack of cooperation between fishing enterprises in the region has not helped.

New Organization Formed

An organization, 'Groupement des Peches Maritimes Bretonnes,' has been formed to advance the industry. It will include vessel owners, crews, manufacturers, wholesalers, canners, and exporters. About 35,000

France (Contd.):

people--⅓ of all the people employed in fisheries in France--will be affected. The organization intends to use all practical means to facilitate or develop the economic activity of its members, to attract the attention of the European Economic Council, and to help industry members solve their problems jointly. The organization, headquartered in Concarneau, will have a Council of Administration of 14 elected members. ("Fishing News International," Dec. 1968.)

USSR

LONG-LINERS TO FISH COD AND HALIBUT IN NORTH ATLANTIC

A long-liner of the Latvian fishing fleet based at Liepaja, Western Fisheries Administration, left for waters off Iceland early in May 1968. It was equipped only with a 15-kilometer (9.4 miles) long line fitted with over 20,000 hooks. Under favorable conditions, the vessel was expected to catch as much as 6 metric tons of cod or halibut per haul. Another 4 long-liners from the same port were expected to leave for the North Atlantic. ("Rybnoe Khoziaistvo" Sept. 1968.)

Long Lining Not New

Vessels of the Northern Fisheries Administration have been fishing halibut with long lines in the Barents Sea since 1962. These caught 1,760 metric tons that year and nearly double that (3,240 tons) in 1963. The Soviets have been long-lining commercially for cod and halibut in the North Atlantic also.

Tests Conducted

In 1966, the Kaliningrad commercial fisheries administration sent 3 medium trawlers (SRT-692, SRT-172, and SRT-104) to explore the area between Iceland and Greenland and to test long-lining for cod and halibut. A scientist from the ATLANTNIRO participated in the expedition.

The Soviets expect to expand the use of long-line gear off Norway, Iceland, Greenland, and Canada to increase substantially their catch of cod and halibut. The total Soviet North Atlantic halibut catches have decreased in recent years from 27,100 metric tons in 1964 to 10,300 tons in 1966.

* * *

PREPARES FOR 1968/69 WHALING SEASON

The USSR is preparing for the Antarctic whaling season. Fleets will be sent to Antarctica from Kaliningrad, Odessa, and Vladivostok.

Only 3 whaling motherships will go to the Antarctic: 'Iurii Dolgorukii' from Kaliningrad, 'Sovetskaia Ukraina' from Odessa, and 'Sovetskaia Rossiia' from Vladivostok. Four whaling motherships will be operating in the North Pacific.

International Quota

To prevent further depletion of whale resources, the Soviet Union and other Antarctic whaling countries are restricted to a total catch of 3,200 blue-whale units during the 1968/69 season.

* * *

THE FRESH-WATER CRAYFISH INDUSTRY

Fresh-water fishery landings from the lower reaches of the Volga River had reached 173,000 metric tons by the end of October 1968. Fishing for crayfish on a commercial scale has been a new development on this river and its tributaries. Crayfish are washed, sorted into 3 sizes, and sent live by air to Moscow and other large cities of the USSR. Because of the high temperatures in summer, they must reach market, still alive, within 4 days. A demand for Soviet crayfish has developed in Finland, Norway, and France. ("Fishing News International," Dec. 1968.)

Decrease in Caspian Catches

Data for total fresh-water fishery catches in the Lower Volga for 1967 are not available, so it is not known whether catches in 1968 were larger or smaller than in 1967. It is known, however, that 1967 landings for the

USSR (Contd.):

entire Caspain Sea lagged behind 1963 landings. In 1963, the Soviets caught about 380,000 metric tons in the Caspian. Preliminary data for 1967 show only about 370,000 tons landed.

Crayfish Catches

Crayfish catches in the Lower Volga and the Caspian are small, probably not exceeding 200-300 metric tons a year.

More is known about the crayfish resources in the River Don. In 1967, "Rybnoe Khoziaistvo," a Soviet fishery periodical published an article by V.P. Negrobov stating that "in 1966 the catches of river crayfish in the Rostov Region were only 14% of 1930 catches." The decline was due to overfishing by "unorganized amateurs" who caught twice as many crayfish as the fishery cooperatives (kolkhozes).

Recommendations for Management of the Fishery

Negrobov recommended fishing licenses for amateur fishermen and restrictions as to location, length of time, and type of gear to be used. Negrobov also accused Azovrybvod, the organization responsible for protection and preservation of fishery stocks in the Sea of Azov and nearby reservoirs, of not knowing either the total catches of crayfish in its control area nor the maximum sustainable yield. He noted that, as a result, Azovrybvod can not properly protect the species (the so-called Kuban crayfish) from overexploitation. He suggested an annual catch limit of about 150 metric tons of crayfish for the Don River, its tributaries, and storage lakes. The Kuban crayfish (the word comes from the Caucasian river Kuban) molt and mate at different times every year so the closed season must be newly determined each year.

Negrobov also suggested an expanded transplantation program for various species of crayfish inhabiting the Azov-Caspian Sea basin and modernization of fishing gear and vessels.

* * *

TROUT BRED IN CAGES

In Ropsha, a suburb of Leningrad, the Soviets have begun breeding rainbow trout in cages as chicken and other poultry are bred. Each cage, the size of an average desk, is stocked with close to 2,000 fish. Although the fish are hampered in their movements, this does not impair their appetite or growth. They devour every bit of feed supplied at regular intervals. It is not known how many cages are planned to be set up. ("Rybnoe Khoziaistvo," Oct. 1968.)

HOW MUCH POWER (ENERGY) IS IN A WAVE?

The kinetic energy in waves is tremendous. A 4-foot, 10-second wave striking a coast expends more than 35,000 horsepower per mile of coast.

The power of waves can best be visualized by viewing the damage they cause. On the coast of Scotland, a block of cemented stone weighing 1,350 tons was broken loose and moved by waves. Five years later the replacement pier, weighing 2,600 tons, was carried away. Engineers have measured the force of breakers along this coast of Scotland at 6,000 pounds per square foot.

Off the coast of Oregon, the roof of a lighthouse 91 feet above low water was damaged by a rock weighing 135 pounds.

An attempt has been made to harness the energy of waves along the Algerian coast. Waves are funneled through a V-shaped concrete structure into a reservoir. The water flowing out of the reservoir operates a turbine which generates power. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ASIA

Japan

SURVEYS SHRIMP RESOURCES IN 5 SOUTHEAST ASIAN COUNTRIES

An 8-man Japanese survey mission studying shrimp resources in 5 southeast Asian countries has found room for further resource development. They noted that it would take a long time to improve the quality of shrimp produced by those countries because of their lack of adequately equipped vessels and cold storages. They also thought undue competition by Japanese trading firms should be eliminated, and saw a need to help build up the local shrimp industries.

Thailand

They found that Thailand, ranking next to Mexico as Japan's leading shrimp supplier, can supply Japan with about 5,000 metric tons annually. However, quality suffers due to the distance over which catches, under inadequate refrigeration, must be transported from port to processing plant. A fishery products exporters association has been formed that could seek quality improvement.

Malaysia

The resource is believed to be abundant in Malaysia, but the government is not actively backing shrimp exports. Processing facilities and refrigeration techniques are still in their early stages of development, although in North Borneo most of the shrimp vessels and processing plants are modern and shrimp quality is good.

Singapore

Singapore does not look promising since it is not a producer of raw shrimp. It imports raw shrimp for processing and reexports it to other countries.

Indonesia

Indonesia's resource is abundant. Quality is poor because shrimp are harvested by fishermen living on many scattered islands where cold-storage facilities are inadequate. It is the most promising country for shrimp resource development. Construction of cold storages and other dockside facilities is the biggest problem.

Philippines

Of the 5 nations, the Philippines is the one most actively striving for shrimp export. It hopes to export shrimp to Japan. Despite resource abundance, fishing vessels and cold storages are few, so there is little hope of obtaining shrimp supply from her in the immediate future. The mission observed that some form of assistance should be extended to develop Philippine shrimp resources. ("Suisan Keizai Shimbun," Dec. 6, 1968.)

* * *

1968 WAS GOOD MACKEREL YEAR

Pacific mackerel fishing off Japan in spring and fall of 1968 was good. Canned mackerel production for both domestic sales and exports was over 10 million cases; it was expected to reach 12 million cases by year's end.

Production of export packs had passed 7 million cases and was expected to total 7.5 million. However, exports were not likely to exceed 6.5 million cases because sales to the Philippines and South Vietnam had slowed down since October 1968. This was due to their delay in setting up letters of credit. Thus, at least 1 million cases of export packs were likely to be carried over to 1969. In 1967, Japan produced 8.06 million cases of canned Pacific mackerel; 4.84 million cases were for export. ("Suisan Tsushin," Nov. 9, and "Kanzume Nippo," Dec. 7, 1968.)

* * *

RECORD HIGH PRICES FOR SEA BREAM AND SQUID

A shortage of 'monko' squid and sea bream taken by Japanese trawlers off West Africa was expected to cause domestic market prices to soar by the end of 1968, when demand peaked. Prices for 'monko' squid averaged US$889-917 a metric ton exvessel in late November; these were expected to advance to a record $1,389 a ton by end of 1968.

Red sea bream, around $611-639 a ton in late November, may have risen to an average of $833 a ton. ("Minato Shimbun," Nov. 22, 1968.)

* * *

Japan (Contd.):

NEW LARGE LONG-LINERS

One of Japan's most modern tuna long-liners, the 'Akitsu Maru No. 7,' 450 gross tons, recently built for Kyokuyo Hogei Fishing Co., departed Oct. 28, 1968, for the bluefin tuna fishing grounds south of Australia.

The vessel is equipped with labor-saving equipment, such as the hanging-type fish freezing system, and the line winder, a new long-line retrieving gear similar to the auto-reel. It carries a crew of 19, including the skipper; previously, a 300-gross-ton long-liner carried 27-28 crewmen.

The vessel is 50.6 meters (166 feet) long, has a beam of 8.9 meters (29 feet), depth of 4.05 meters (13.3 feet), a main engine of 1,250 hp., and maximum speed of 13.1 knots.

Other Vessels

Another large portable-boat-carrying tuna longliner (499 gross tons) was ordered by the Daien Fishing Co. To be named 'Daien Maru No. 11,' she was scheduled to be completed by Miho Shipyard in Shizuoka Prefecture for delivery in January 1969.

A similar-sized longliner, ordered earlier by Daien, was scheduled for delivery in late December 1968. ("Minato Shimbun," Nov. 13, and "Nihon Suisan Shimbun," Nov. 11, 1968.)

* * *

CANNED TUNA SALES DROPPED IN 6-MONTH PERIOD

Canned tuna in brine sold by the Tokyo Canned Tuna Sales Co. to trading firms during April-September 1968 totaled 1,202,849 (standard) cases. This is a decline of about 700,000 cases from the 1967 period, when sales reached 1,901,722 cases.

Tuna in oil validated for export during April-September 1968 totaled 1,162,045 cases, down 271,700 cases from the comparable 1967 exports.

Tuna specialty packs validated for export during the 1968 period were 644,146 cases, up about 130,000 cases over the comparable 1967 figure.

Tuna in brine validated for export to countries other than the U.S. during April-September 1968 totaled 24,648 cases, compared with 11,730 cases for the 1967 period. ("Suisan Tsushin," Nov. 15, 1968.)

* * *

BUYS MORE MEXICAN SHRIMP

In late October 1968, Japanese trading firms negotiating for Mexican west coast shrimp were believed to have contracted for over 1,000 tons of frozen shrimp for November. The new supply was scheduled to arrive in Japan in December.

The Japan Marine Products Importers Association has set a 1,000-ton monthly ceiling for Mexican shrimp imports. When purchases reach that level, the Association cautions trading firms not to make any further contracts during that month.

Quantity buying in November was due to the delayed opening of the Mexican west coast shrimp fishery. The delay caused competition among trading firms for Mexican shrimp for Japan, where holdings of medium and small shrimp had sharply declined during the preceding months. Mexican shrimp suppliers, anticipating the rush, were reported to have raised prices 2 cents a pound for the 26-30, 31-40, and 41-50 counts. ("Suisan Tsushin," Nov. 29, 1968.)

* * *

FROZEN SHRIMP IMPORTS DROP

In Oct. 1968, Japan imported 2,496 metric tons of frozen shrimp worth about US$4.79 million; 3,200 tons were imported in Oct. 1967. The decline was attributed to the total absence of shipments from Persian Gulf countries and from Central American countries other than Mexico. Japanese trading firms were reported hustling to buy shrimp, but were having difficulty in rounding up supplies. Leading suppliers in October 1968 were Hong Kong, Thailand, Pakistan, and Communist China. ("Suisancho Nippo," Nov. 22, 1968.)

日本

SOUTH PACIFIC

Australia

FISH MEAL IMPORTS RISING

In the past 5 years, Australia's fish meal imports have increased more than threefold--from 18.7 million pounds in fiscal year (FY) 1963/64 to 61.7 million pounds in FY 1967/68 (July 1967-June 1968). Imports in FY 1967/68, double the previous year's, equaled about 300 million pounds of fish, round weight; this was 3 times the total annual fish catch.

Australia imported 30,869 short tons of fish meal in FY 1967/68. South Africa supplied 20,608 short tons; Chile, 8,128; American Samoa, 1,042; Peru, 718; and other countries, 373. Average import value dropped from A$139 a short ton in 1966/67 to A$104 in 1967/68 (A$1 = US$1.12).

Fish Meal Production Steady

Fish meal production was the same in 1967/68 as in 1966/67--2.2 million pounds.

Rapidly growing imports and rising interest in establishment of reduction plants reflect the increased emphasis on scientific livestock feeding methods, particularly for poultry and pigs. ("Australian Fisheries Newsletter.")

* * *

FOREIGN VESSELS IN AUSTRALIA'S 12-MILE ZONE

At least 3 times in 1968, Taiwanese fishing vessels, allegedly fishing or transiting inside Australia's 12-mile territorial seas, created a minor public furor, particularly in Queensland. In the latest incident, in Oct. 1968, 5 vessels were sighted in the general vicinity of Portland Roads, 250 miles north of Cooktown, Queensland.

One Australian trawler reported that crew members of a Taiwanese vessel went ashore on October 31 without the Australian Government's authorization, apparently in search of fresh water.

Public Concern

Continued sightings of Soviet, South Korean, and Taiwanese vessels fishing off Australian coasts have spurred public and industry interest in government action to ensure that such vessels fish only in international waters. While patrol craft are sent to investigate reports of foreign vessels in the 12-mile limit, many commentators believe that Australia's capability is too limited to allow for adequate patrol of offshore waters.

American Samoa

NEW TUNA PRICES

Japanese tuna suppliers and U.S. packers in American Samoa agreed on December 1968 and January 1969 prices. Albacore increased $20 a ton and yellowfin $5 a ton in December 1968. There was to be an additional $5 a ton increase for all January 1969 deliveries.

December prices, per short ton: round albacore--frozen, $410; iced, $395; g. & g. yellowfin--frozen, $335; iced, $312.50. ("Suisan Keizai Shimbun," Dec. 6, 1968.)

INDEX

TROPHY TROUT

Coals from last summer's campfire have cooled. Ashes have scattered. Trout caught from cold waters and pan-fried beside the stream are only a memory.

Stir the coals back to life with this outdoorsy method of frying trout. Whether you take one of last summer's catch from the freezer or cast into your supermarket fish department, you will hook a trophy meal of bragging-size taste with trout marinated in a buttermilk-onion soup mixture and then fried.

Rainbow Trout

You won't need an expensive fishing pole or an expensive taste to angle trout onto your menu. Trout are now available to any home campfire in freezer convenience. In addition to being high in nutritive value, they are firm, easy to handle, and easy to prepare.

Apply this recipe to trout, and you will get the same mealtime enjoyment from young and old, fisherman and non-fisherman. Only their thoughts will be different--the romantic adventure of a mountain trip that wafts through the memories of a fashion-conscious fly caster; the button-popping proudness of a young pole-and-stringer; the quiet pleasure of a grizzled veteran as he caps another successful fishing trip with a tasty trout dinner; and the shared pleasure by all table guests of a filling, tasty meal.

Not to be outdone by the fishermen in her family, the homemaker can match any angler, creel for creel, by wisely baiting her menus with this finny delicacy.

TROPHY TROUT

- 3 pounds pan-dressed rainbow trout or other pan-dressed fish, fresh or frozen
- 1 cup buttermilk
- 1 package ($1\frac{3}{4}$ or $1\frac{3}{8}$ ounces) onion soup mix
- 1 cup flour
- Lemon wedges
- Fat for frying

Thaw frozen fish. Clean, wash, and dry fish. Place in a single layer in a shallow baking dish. Combine buttermilk and soup mix. Brush fish inside and out with sauce. Let stand 1 hour. Remove fish from sauce and roll in flour. Fry fish in hot fat at moderate heat for 4 to 5 minutes or until brown. Turn carefully and fry 4 to 5 minutes longer or until brown and fish flakes easily when tested with a fork. Drain on absorbent paper. Serve with lemon wedges. Makes 6 serving.

The latest methods for purchasing, handling, storing, and preparing fish are included in the new, 60-page, complete guide to fish cookery, "Let's Cook Fish." This valuable, full-color reference and recipe book is available by sending 60¢ to the Superintendent of Documents, Washington, D. C. 20240.

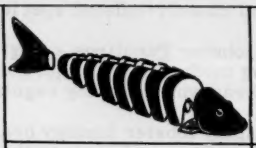
MARKET FORMS OF FISH

Fresh and frozen fish may be bought in a variety of cuts, the more important of which are shown here. Knowing the cuts and their particular uses is important in buying or selling fish. The edible portion varies with the type of cut, from 100 percent for fillets to about 45 percent for whole fish.

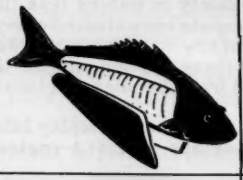
Whole or round fish are those marketed just as they come from the water. In this form, the edible portion is about 45 percent of the whole, but varies with size and kind of fish. To prepare for cooking, fish should be scaled and eviscerated and, if desired, head, tail, and fins should be removed. Fish then may be used for baking, or may be sliced, filleted, or cut into steaks or chunks. Small fish, like smelt, are often cooked with only the entrails removed.

Drawn fish are those marketed with only the entrails removed. In this form, the edible portion is about 48 percent, but varies with size and kind of fish. To prepare for cooking, they are generally scaled. Head, tail, and fins may be removed, if desired, and the fish split, filleted, or cut into steaks or chunks.

Dressed fish are scaled and eviscerated, usually with the head, tail, and fins removed. Edible portion in this form is about 67 percent, but varies with size and kind of fish. The smaller sizes are ready for cooking as purchased (pan dressed). The larger sizes may be baked as purchased or may be cut into fillets, steaks, or chunks.



Steaks are cross-section slices of the larger sizes of dressed fish, usually about ¾ of an inch thick. In this form the edible portion is about 84 percent. Steaks are ready to cook as purchased.



Fillets are the sides of fish cut away from the backbone. They are practically boneless and have little or no waste. Fillets are ready for cooking. The skin may be left on or may be removed. A fillet cut from one side of a fish is called a single fillet. This is the type most generally seen in the market.

Butterfly fillets are the two sides of the fish corresponding to two single fillets held together by the uncut flesh and skin of the belly.

Sticks are pieces of fish cut lengthwise or crosswise from fillets into portions of uniform width and length, usually about 1 inch wide and 3 inches long.

MARKET FORMS OF SHELLFISH

Some shellfish are marketed alive. Other market forms, depending on the variety, include cooked whole in the shell, fresh meat (shucked), headless, and cooked meat.

In shell: Shellfish, such as hard and soft blue crabs, lobsters, clams, and oysters should be alive if bought fresh in the shell. Crabs and lobsters may also be cooked in the shell. Edible portion varies widely.

Shucked: Clam, oyster, and scallop meats may be bought free of the shell, commonly known as shucked. In this form the portion is 100 percent edible.

Headless: Only the tail part of shrimp is commonly marketed. Spiny-lobster tails are also a common market form. About 85 percent is edible.

Cooked meat: The edible portion is picked from the cooked shellfish. Crab, shrimp, and lobster meat is marketed in this way. Cooked meat is perishable, although packaged in containers, since it is not further processed by heat. It is 100 percent edible.

--Fresh and Frozen Fish Buying Manual, Circular 20, Fish and Wildlife Service.

SPINY LOBSTER GEAR AND FISHING METHODS

Fishery Leaflet 487, Spiny Lobster Gear and Fishing Methods describes the gear and methods known and used specifically in the Florida area. Modified versions may be found in other areas since the spiny lobsters' range includes the tropical, subtropical, and some temperate seas of the world. At present, commercial spiny lobster fishing is practiced in Florida, throughout the Caribbean, Central America, South America, Mexico, South Australia, Korea, and other countries of the Far East. Several closely-related species are involved.

To catch the spiny lobster Panulirus argus, Florida fishermen have effectively used several types of gear and fishing methods. Although some of these are now illegal in Florida, they may be permitted in other areas where fishing regulations differ.

Certain factors of spiny lobster biology bear directly on the gear and methods used to catch them. They are taken mainly in waters less than 50 feet deep, although they are known to occur in greater depths. Biologists have studied spiny lobster migrations and have found that they move between inshore and offshore waters as well as along shore during various periods of their life cycles. A knowledge of these movements, as they relate to seasonal, weather, and water conditions of an area, is used by fishermen in planning their operations.

There is little standardization in spiny lobster boat design. Boats used range from 14-foot skiffs, which are rowed or are outboard-engine powered, to motor launches.

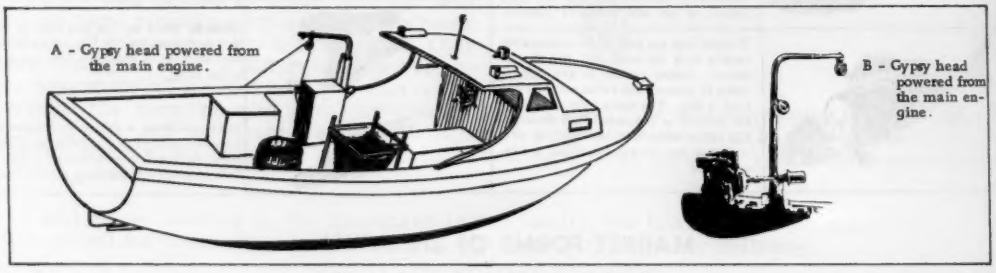


Fig. 1 - A typical spiny lobster motor launch.

The typical commercial launch is wooden hulled, of shallow draft, 26 to 36 feet long, and is powered by an engine of 125 to 150 hp. Diesel engines, marine gasoline engines, and converted automobile engines are used. The Diesel's cheaper maintenance and fuel costs make it the preferred engine, but its higher purchase cost prevents most boat owners from installing it. For this reason marine gasoline engines and converted automobile engines are much more commonly used.

The most popular commercial gear is the wooden lath trap. Florida law limits its maximum dimensions to 3 by 2 feet. Some fishermen build traps to this size; others reduce all dimensions but retain the rectangular shape. Still others reduce top dimensions only, thus forming a flat-topped pyramid (fig. 2).

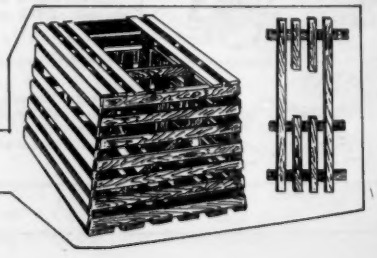


Fig. 2 - Pyramid-type wooden lath trap with removable lid.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1969 341-144/7

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

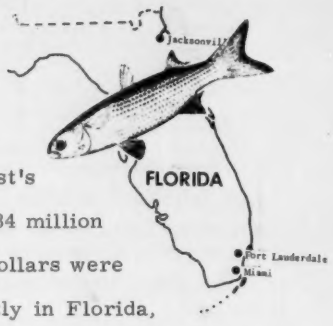
The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

"MULLET COUNTRY"



The mullet--a long-time favorite of commercial fishermen on the Gulf coast--is gaining recognition as one of the Southeast's more rapidly developing species. Over 34 million pounds of mullet valued at 2.3 million dollars were harvested in 1967. Although caught mostly in Florida, this species abounds along the U.S. seacoast from North Carolina to Texas.

A 14-minute, 16mm. sound, color film about this advancing fishery has been produced by the Bureau of Commercial Fisheries in cooperation with the Florida Board of Conservation. The film, "Mullet Country," traces the history of the species back to the Egyptian, and follows its present distribution channels from fishing vessel to consumer's table. "Mullet Country" received a silver award at the 1968 International Film and Television Festival held in New York City.

A catalog of 26 fishery motion pictures, including "Mullet Country," is available, free of charge, from Audio-Visual Services, Bureau of Commercial Fisheries, 1815 North Fort Myer Drive, Room 601, Arlington, Virginia 22209.